ACI News Letter

Vol. 26, No. 8 JOURNAL of the AMERICAN CONCRETE INSTITUTE April 1955

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Owner: Mackinac Bridge Authority
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MILWAUKEE CONVENTION SECOND LARGEST

Convention registration at ACI's 51st Annual Convention, held at the Hotel Schroeder, Milwaukee, February 21-24, was the second largest compiled in Institute history. The program drew 826 registrants, as well as a splendid turnout of 75 wives attending and enjoying the special program arranged for them.

Only the 1948 Denver convention tops this registration figure with a total of 886 registrants. The Golden Anniversary Convention in Denver in 1954 drew 786 registrants plus 165 wives. The 1953 Boston convention drew 804. The Institute has met twice before in Milwaukee, in 1906 and in 1931.

All activities—from the full day of technical committee meetings on the first day to the final session on research—drew large audiences. The exhibit area also received a good share of attention.

Convention sessions covered a wide range of subjects, including correlation of field and laboratory freezing and thawing results, European precast concrete, and one complete session devoted to lightweight aggregates and lightweight concrete.

On February 23 there were two sessions running concurrently in the morning and afternoon. The pavement session discussed paving concrete for municipalities, design of joints, use of steel in crack control, and prestressed pavements. The session on construction had papers on a prestressed elevated water tank in Dallas, use of prepacked concrete on the Alcan project in British Columbia, lift-slab construction in Detroit, and construction of the shell roofs at the St. Louis municipal airport terminal.

Afternoon sessions of the same day covered design and research, and construction equipment. The design and research session featured shear and diagonal tension tests, strength of lap splices

Continued on p. 4

in tension, strength of T-beams in shear and torsion, and moments in shells of rotation due to live load and temperature. Concrete mixers, slip-forms for slope paving, use of an electrical resistance moisture meter, and batch plant recorders and controls were discussed at the session on construction equipment.

The final day included a tour of concrete equipment manufacturers and the annual open meeting of ACI Committee 115 Research.

In addition to the technical program and the special exhibits, social events were arranged for both the men and the ladies.

The majority of the papers presented at the Milwaukee meeting, some of which have already appeared in the ACI JOURNAL, will be published in later issues.

Technical committees hold work sessions

The first day of the 51st Annual Convention was devoted exclusively to "work sessions" for more than 20 technical committees concerned with various phases of concrete design, research, and construction.

The committees meeting were: Committee 208—Bond Stress; Committee 209—Volume Changes and Plastic Flow in Concrete; Committee 210—Resistance to Erosion in Hydraulic Structures; Committee 214—Evaluation of Results of Compression Tests of Field Concrete; Committee 215—Fatigue of Concrete; and Committee 315—Detailing Reinforced Concrete Structures.

Committee 318—Standard Building Code, as well as several subcommittees, held work sessions. Other committees were: Committee 323—Prestressed Reinforced Concrete (Joint ACI-ASCE); Committee 324—Precast Reinforced Concrete Structures; Committee 326—Shear and Diagonal Tension (Joint ACI-ASCE); Committee 327—Ultimate Load Design (Joint ACI-ASCE); Committee 331—Structures of Concrete Masonry Units; Committee 332—Recommended Practice for Residential Concrete Work.

Committee 604—Winter Concreting Methods; Committee 611—Inspection of Concrete; Committee 612—Recommended Practice for Curing Concrete; Committee 613—Recommended Practice for Proportioning Concrete Mixes; Committee 617—Specifications and Recommended Practice for Concrete Pavements and Bases; Committee 711—Precast Floor Systems for Houses; and Committee 716—High-Pressure Steam Curing.

First general session

The first general session on Tuesday morning, February 22, was presided over by President C. H. Scholer. The program included a report on the Long-Time Study of Cement Performance in Concrete, a description of some European practices in precast concrete, and a collection of amusing anecdotes and experiences about the concrete construction industry.

Long-Time Study

A report by F. H. Jackson, engineering consultant, Washington, D. C., "Correlation of the Results of Laboratory Tests with Field Performance under Natural Freezing and Thawing Conditions," covered another phase of the Long-Time Study of Cement Performance in Concrete.

The principal objective of the Long-Time Study has been to determine the effect of variations in raw materials and in the chemical and physical properties of cements and in the methods of manufacturing cements on the durability of concrete. Another major objective has been to determine the significance, in terms of field performance, of the numerous tests that have been developed to define desirable characteristics of portland cement for both general and specific uses. Such tests include, in addition to the generally used American Society for Testing Materials' tests for fineness, strength, sound-

ness, etc., many tests designed to measure other specific properties of cements such as bleeding characteristics, tendency to premature stiffening, cracking tendency, heat of hydration, resistance to freezing and thawing, and resistance to sulfate attack. There are also such tests as the Merrimam "sugar" test, the Paul clinker autoclave test, and the Paul "floc" test that were developed specifically for detecting under-burned clinker. Many of these tests have been incorporated in purchase specifications for cement.

Mr. Jackson then discussed available laboratory data on the Long-Time Study cements, correlating the results with the field performance of these same cements in concrete that has been exposed to natural weathering for about 12 years.

In selecting sites for the various field projects, said Mr. Jackson, an effort was made to provide a wide variation in exposure conditions ranging from the severe conditions encountered in western New York, in Massachusetts, and in the high altitudes of the Rockies and the High Sierras, to the mild climates of southern Georgia, Florida, and southern California. Actually, he said, visible evidences of deterioration after 12 years' exposure to natural weathering have become sufficiently pronounced to justify comparison between cements on three projects only. These were the New York Test Road, the reinforced concrete piles at Cape Cod, Mass., and the installation of "near-job-size" specimens at Naperville, Ill. He gave a brief description of each of these projects and used them as the major basis for the comparison between laboratory results and durability.

Among the conclusions presented by Mr. Jackson was the fact that laboratory freezing and thawing tests of concrete correlate very well with field performance in showing the marked improvement in durability that was obtained by the use of entrained air.

European precast concrete

An interesting report on European precast concrete was given by Douglas McHenry, director of development, Thor Germundsson, manager, Structural and Railways Bureau, and Eivind Hognestad, manager, Structural Development Section, Portland Cement Assn., Chicago. They described and commented on the precasting or prefabricating of structural concrete members either on the job-site or in factories as seen on a visit to England, France, Germany, The Netherlands, Denmark, Sweden, and Norway.

In introducing the subject Mr. McHenry made the following quotation: "No doubt the reason that this form of construction—that is, factory precasting—is not more generally used is due to the excessive cost of equipping a plant for manufacturing. Sufficient development has already taken place, especially in Europe and in a few instances in America, where buildings have been erected on the unit system of separately molded members made at the site to demonstrate its practicability. The true economy of this form of construction will only be demonstrated when the system is extended to factory-made members."

Mr. McHenry went on to point out that the quotation was from a paper by Charles D. Watson, published in the ACI (then the National Assn. of Cement Users) *Proceedings* of 1908. That quotation gave rise to the question: why was precasting nearly dormant for a number of decades and why has it shown such vigorous growth within the last decade?

In answer to that question, he said: "The potentialities of precasting structural concrete go far beyond the mere concept of

Harrison F. Gonnerman (left), engineering consultant, Oak Park, Ill., chats with newly-elected ACI Director Douglas McHenry, director of development, Portland Cement Assn., Chicago

casting a member on the ground instead of several stories above ground or on the river bank instead of in midstream. These potentialities result in large part from technological developments which have been either made or started in the past few years—developments which were not available a few decades ago.

"Because of improved compaction methods, low slump concrete of strengths approaching 10,000 psi are coming into the picture, particularly for factory precasting. Vacuum treatment has been successful in speeding up production line methods. We now have available some lightweight aggregates which will produce concrete weighing 100 to 115 lb per cu ft with 28-day compressive strengths of 8000 psi. Obviously that circumstance alone, particularly again for factory precasting where we have ideal conditions for manufacturing control, opens up a great field of possibilities.

"Experiments with form materials and form oils are leading to methods of obtaining better surfaces. The development of high-strength steels for prestressing and for conventional reinforcement has likewise opened up new possibilities for the more efficient use of reinforcement. Improved understanding of structural action is leading to new methods of joining and supporting precast members, methods which are economical and which are also reducing the importance of one of our oldest problems—drying shrinkage of concrete."

Mr. McHenry went on to say that Europeans have made much progress in precast concrete and, in fact, are developing what may almost be referred to as a new concrete technology. He emphasized, however, that: "No one in the world is in a better position than we are to develop and use improved procedures in the building industry as we have so successfully in many other industries."

Dr. Hognestad then described factory-made precast structural members. He defined them as the major units of framing and paneling used in building construction and the load carrying members of bridges.

As a side light he noted that European precast concrete is a broad subject covering production of a variety of units from masonry block to huge girders, from flower pots to large wall panels, even including wings for guided missiles.

Among the prestressing factories described by Dr. Hognestad was Shockbeton, Inc., Kampen, The Netherlands. He noted that this was probably the biggest precasting plant in existence. Working at capacity it employs 1000 men, a 125-man transport and erection department, over 20 structural designers, plus administration and sales personnel. Although most of the units made in this factory are sold and used in The Netherlands, some shipments have been made as far as the African Gold Coast and to Greenland. The Kampen factory represents a well organized permanent industry of considerable size and complexity, he said.

In pointing out that a principal economic advantage of precasting lies in the repeated use of forms, Dr. Hognestad described the hangars at London Airport in England. For the two rows of five hangars each, a total of 3047 segments were precast in only nine forms, an average of 340 repetitions in the use of each form; this was for the 110-ft roof beams precast in about 25 segments.

Dr. Hognestad said that in Denmark the

From near and far

As is always the case, the area surrounding the convention city provided the largest attendance group at ACI's 51st Annual Convention. Altogether 38 states were represented as well as the District of Columbia, Australia, Canada, and Mexico.

Wisconsin	279	Virginia	4
Illinois	156	Maryland	3
Ohio	45	S. Carolina	3
Michigan	37	W. Virginia	3
New York	37	Alabama	3
Canada	36	Australia	3
Pennsylvania	34	Nebraska	2
D. of C.	21	New Mexico	2
Missouri	19	Oklahoma	2
California	17	Washington	2
Indiana	17	Arizona	1
Colorado	16	Connecticut	1
New Jersey	15	Florida	1
Minnesota	14	Idaho	1
Iowa	12	Kentucky	1
Texas	12	Louisiana	1
Massachusetts	7	Maine	1
Georgia	4	Mexico	1
Kansas	4	N. Carolina	1
Mississippi	4	N. Dakota	1
Tennessee	4	Utah	1

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architects feel that factory precasting has given them a new freedom in the use of architectural concrete. He pointed out that superior surface appearance comes about through a carefully developed four-way balance of dry concrete proportioning, form materials, form lubricants, and compaction methods.

In addition to the repetition of members in a single structure, Dr. Hognestad said that most factories in Europe have gone one step further in that they have carefully selected a slate of standardized beams, slabs, and piles. Such units are offered for sale in well-prepared catalogs which include the handbook properties a designer needs. Also due to careful factory control of materials and workmanship the authorities in several of the European countries permit the use of advanced design methods.

"Catalogs, advanced design methods, and an intimate cooperation between consulting engineers and the design office of factories are all important characteristics of European factory precasting," said Dr. Hognestad.

Mr. Germundsson then covered the use of precasting on the site. It is not always possible, he said, to draw a sharp line of distinction between the two types of procedures, that is, factory precasting or site precasting, because even when concrete is precast on the job-site the work has to be performed so carefully and is so well organized that, in fact, it becomes closely similar to factory production. He then described and illustrated some of the construction sites visited on the European tour.

A highlight of Mr. Germundsson's presentation was a motion picture showing in detail the construction of a five-story warehouse near London. The building has four supported floors and a roof. Two different precast frame systems were used, one for floors and another for the roof. All beams and columns were precast on the site, joists on the roof were factory precast, and the floor slabs were cast in place. Exterior columns were cast and erected in one piece four stories high. Precast framing for floor support consisted of two-column bents with short cantilevers connected by short drop-in beams. Roof framing consisted of Y-shaped column elements with drop-in beams.

Mr. Germundsson's movie also showed shots taken during construction of multistory apartment buildings in London, where all beams were precast but columns and floor slabs were cast in place. Also shown were construction views of multistory apartments in France in which wall panels, floor panels, and interior bents were precast. Interior columns and beams were precast as two-span bents, with ledges formed in the beams for support of the precast floor slabs.

(On p. 757 of this month's JOURNAL is a description of one of the projects visited.)

Facts and fiction

Robert C. Johnson, president, Siesel Construction Co., Milwaukee, closed the session by presenting some "Concrete Facts and Fiction." He presented a collection of amusing anecdotes and experiences dealing with the concrete construction industry. The majority of the experiences dated back to the early days of the concrete industry, some as early as 1907.

Looking ahead to 1956

With the successful completion of the 1955 convention in Milwaukee, ACI's Technical Activities Committee is already looking toward the 1956 meeting in Philadelphia and planning the program.

All those who have in mind offering papers for presentation at the 52nd annual meeting should write to Institute headquarters no later than July 1, furnishing a synopsis which should make clear the intended scope of the paper and indicate features that, in the opinion of the author, will justify its inclusion in the program. Contributors should be prepared to have first drafts of manuscripts in the hands of the Technical Activities Committee for appraisal and acceptance by Sept. 15, 1955, and final manuscripts by Jan. 1, 1956.

From the replies received and suggestions from other sources, TAC will select the papers to make up each convention session. Write Institute headquarters about that contribution *you* believe merits a place on the program.

Lightweight aggregate concrete

The afternoon session was devoted exclusively to lightweight aggregates and lightweight aggregate concrete. The session was organized by ACI Committee 213, Properties of Lightweight Aggregates and Lightweight Aggregate Concrete, and George W. Washa, committee chairman, presided over the session. After the presentation of four prepared papers there was an open forum discussion of the subject.

George W. Washa, associate professor of mechanics, University of Wisconsin, Madison, spoke on "Lightweight Aggregates and Concrete." The structural, masonry, and insulating uses of lightweight concrete were described showing the range of properties of each type of use. He also discussed lightweight concrete in terms of how it is made—such as the use of mechanical air entrainment or chemical agents for producing foamed concrete, the use of organic materials (such as sawdust concrete); and the use of lightweight mineral aggregates.

R. W. Kluge, head, Department of Civil Engineering, University of Florida, Gainesville, presented information on lightweight structural concrete under three major headings: properties in general of plain lightweight concrete, design aspects of reinforced lightweight concrete, and construction practices. Under properties, aggregate gradation, air entrainment, workability, densities versus compressive strength, and elastic properties were covered. Design aspects included bond and shear resistance and proposed design factors. Recommended mixing and placing techniques and field control were the major considerations under construction practices.

Detailed information on the use of lightweight concrete in the field of concrete masonry and precast units was presented by C. C. Carlson, manager, Products and Applications Development, Portland Cement Assn., Chicago. Proportioning and mixing were discussed, including equipment and procedure, and their influence on various characteristics of the finished units. Molding, curing, and drying of lightweight concrete masonry units were considered. Among the physical properties given special attention were heat transmission and sound absorption. Special applications of lightweight masonry units discussed included reinforced floor systems and prefabricated structural members.

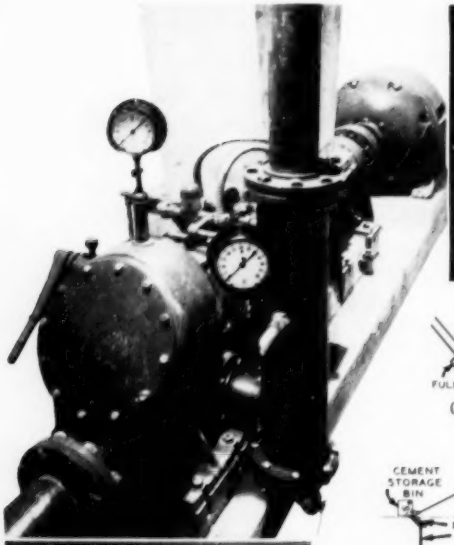
Insulating concrete was covered by R. C. Valore, Jr., materials engineer, National Bureau of Standards, Washington, D. C. He first classified insulating concrete according to function and discussed (1) thermal insulation, (2) fire protection, (3) fill, and (4) sound insulation. He also classified it according to composition: lightweight aggregate concrete and cellular concrete. He also classified and discussed insulating concrete according to density. The problems of composition and preparation, as well as properties, were considered.

Open forum

Although various problems were discussed during the open forum, probably major attention was devoted to the problem of shrinkage. One speaker brought out various methods of reducing shrinkage and cracking: (1) using dense aggregate instead of lightweight aggregate, which reduces shrinkage some; (2) use of autoclave curing may reduce the shrinkage perhaps as much as 50 percent when compared with ordinary moist curing; (3) use of dry block instead of wet block at the time of placing makes for further reduction of shrinkage. He then noted that all of these methods reduce shrinkage but do not eliminate cracking. One approach to eliminate cracking, or at least make it less noticeable, was the use of adequate wall reinforcement.

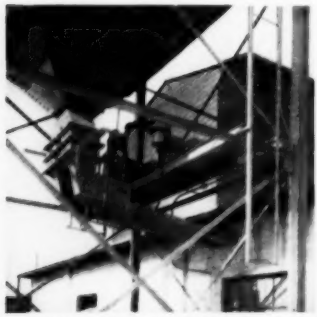
Another speaker believed that the additional cost of heavy wall reinforcing to minimize cracking was not justified since only fair results had been obtained. He felt that the most effective measure was the use of control joints.

In the case of concrete masonry, he said that there was not quite as much shrinkage as in the case of cast-in-place concrete but, nevertheless, it is advisable, at least in

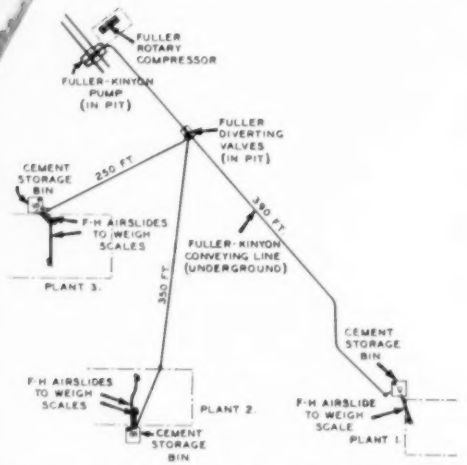


PAT BLOX gets fast-clean UNLOADING and DISTRIBUTION with the FULLER-KINYON CONVEYING SYSTEM

F-K transport line entering bin. F-H Airslide from bin to weigh scale. (Plant 1 in plan)



Airslides from bin to weigh scales. (Plant 2 and 3 in plan)



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buildings of any importance, to take certain precautions to control those movements and prevent objectionable cracking.

"Better guidance is needed on control joints, particularly on spacing of control joints, how they should be detailed, and where they should be located in the structure," he said. He also emphasized that it was not a simple problem. A structure is a complex thing and you cannot make a set of drawings and in a matter of a few moments determine the best locations for control joints. You cannot take the properties of a particular concrete unit and arbitrarily determine how far apart the control joints should be spaced.

He mentioned that the Corps of Engineers had adopted certain criteria which they believed would reduce cracking in concrete masonry buildings. These were a moderate use of longitudinal reinforcing, a tighter specification on the moisture content of the block, and the use of control joints. He noted that he had found that at least two factors which affected the spacing of control joints were the height of a wall and the properties of the block.

He noted that perhaps the concrete industry has been a bit negligent in developing information on control joints to help architects, but he also felt that the architects themselves have been a little negligent in, first of all, not having better specifications covering concrete masonry units and secondly in not enforcing those specifications. Frequently, block is purchased strictly on a price basis without too much regard for quality.

Pre-wetting of lightweight aggregates prior to mixing also came in for considerable discussion.

The testing of the compressive strength of lightweight concretes was also discussed—whether the concrete should be in an oven-dried condition or a saturated condition. One speaker pointed out that concrete in the structure is rarely found in an oven-dried condition by and the same token is not found in the saturated condition. He pointed out that in determining the compressive strength of low-density concretes we are primarily concerned with the strength for the intended use. He suggested that probably the best procedure for testing this kind of concrete might be to bring the sample to a condition where it has been cured and brought to equilibrium at 30 to 50 percent humidity rather than in either a saturated or oven-dry condition.

Motion pictures shown at evening session

An evening session featured motion pictures on various phases of concrete construction. "New Breakwater Construction Techniques" from Intercontinental Technical Enterprises, Inc., Chicago, showed laboratory studies leading up to the development of huge concrete "tetrapods" for breakwaters. The making and placing of these large units was also pictured. "Prestressed Concrete Over Tampa Bay," from Preload Construction Corp., New York, showed construction procedures in making and installing precast prestressed beams using the Lee-McCall system for the Lower Tampa Bridge in Florida. "Power from Niagara," from B. Perini & Sons, Inc., Framingham, Mass., illustrated work on the Niagara Falls tunnel project being built for the Hydro-Electric Power Commission of Ontario. "Pumped Concrete," from Chain Belt Co., Milwaukee, showed various types of projects that utilized pumping techniques to transport and place concrete.

ACI Director Vernon P. Jensen (left), manager of betterments, C. F. Braun & Co., Alhambra, Calif., and Douglas E. Parsons, chief, Building Technology Division, National Bureau of Standards, Washington, D. C., study a "weighty" problem

Prestressed concrete pavements offer new solution for highway and airport problems

With the attention now being given the nation's highway needs and the program proposed by President Eisenhower—and with increasingly heavier aircraft and jets changing airport pavement design criteria—added emphasis is being placed on methods and materials for building better pavements.

In designing rigid pavements engineers attempt to produce a concrete slab which can carry the maximum anticipated load and can resist the stresses which develop as the result of volumetric changes either in the concrete itself or in the supporting base material. Fatigue due to the great repetition in loadings becomes a determining factor in highway pavement design. In airport pavement design, the new and heavier aircraft and the heat and blast effect of jet engines create new problems which require practical and economical solutions.

Speaking at the session on pavements Wednesday morning, presided over by President C. H. Scholer, Thomas Cholnoky of Frederic R. Harris, Inc., New York, said that while concrete has proved successful in all kinds of pavements in comparison with other materials used for the same purpose, the need for improvement is always at hand, and prestressed concrete may lead to the solution of some unanswered problems.

The main advantages of prestressed concrete were characterized as: (1) greater load carrying capacity; (2) elimination of a great number of expansion and contraction joints, which are needed in conventional concrete pavements.

Together with these two basic features, there are several others which are the result of these and are just as important.

Prestressing provides a residual compressive energy in pavement, Mr. Cholnoky pointed out. This energy will restore continuity of the pavement after any excessive or accidental load or other stress producing phenomenon introduces stresses exceeding the flexural or tensile strength of the concrete, but do not exceed the ultimate strength of the prestressed section.

Concrete pavements with prestressing can be built thinner than comparable slabs without prestressing. They are more flexible and therefore less susceptible to the effects of deformation which may develop in the base.

The effect of temperature changes, being a function of pavement thickness, will be reduced also in prestressed concrete pavements, he said.

The concrete under compression, Mr. Cholnoky noted, will offer a higher resistance against surface wear and will provide a smooth surface without cracks.

The load carrying capacity of prestressed pavement is not increased merely by providing additional compression to increase the flexural strength of the concrete. The real value of prestressing becomes apparent, said Mr. Cholnoky, after the cracking of the pavement, at which point, the prestressing tendons will behave as reinforcement in the concrete section. As long as the stresses in the tendons and the concrete remain within the elastic range, the pavement will regain its original shape and load carrying capacity by virtue of its inherent compressive energy.

Prestressing should be considered practical only if means are found to adopt its use to the present paving methods, Mr. Cholnoky emphasized. He felt that prestressing will improve highway and airfield pavements only if it can be accomplished on a competitive level with present conventional practice. The valuable experience gained in this country by various contractors in linear and circular prestressing in the structural field, he believed, should encourage paving contractors to develop practical means for their field.

Mr. Cholnoky concluded by describing briefly the research and development program for prestressed concrete airfield pave-

For this $8,000,000 medical school and hospital, Mr. N. W. Overstreet, one of the architects, writes, "No other systems were considered, because we know that reinforced concrete is less expensive and better." Mr. H. N. Howe, the structural engineer, adds, "Numerous studies over a period of years have invariably shown that a reinforced concrete frame is more economical for fireproof buildings of light occupancy."

On this job, as on jobs over the entire country, reinforced concrete gives a better structure for less money—and materials are always readily available for quick starts. It's a flexible medium, too, inherently firesafe, and highly resistant to shock. On your next job, design for reinforced concrete.

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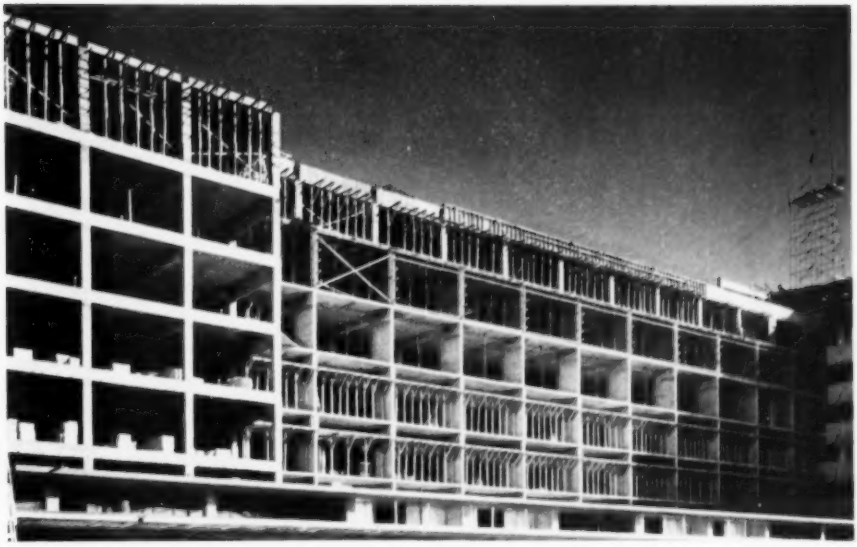

University Medical School and Teaching Hospital, Jackson, Mississippi
Architects: MNO Associated Architects; E. L. Malvaney, R. W. Naef, N. W. Overstreet
Structural Engineers: Gardner & Howe, Post & Witty Associated

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38 South Dearborn Street
Chicago 3, Illinois

ments undertaken by the U. S. Navy Bureau of Yards and Docks. A test slab 500 ft long, 12 ft wide, and 7 in. thick has been built. He felt that test results from the program are promising and that clarification on some problems have been obtained already.

The paper evoked considerable discussion and various speakers described briefly other research going on in this field, particularly in Germany and England.

Other papers in the session were also devoted to pavement problems—covering proportioning and control of paving concrete for municipalities, design of joints for pavements, and design of steel reinforcement for crack control in concrete pavements.

Municipal paving

While technical literature abounds in descriptions of mix proportioning methods and quality control procedure for concrete, translating such data into practical municipal field work poses administrative problems involving engineering staff available, laboratory facilities, number of projects involved, number of contractors, involved, and other factors. How the City of Milwaukee handled these problems in its recent large paving program was described by R. A. Burmeister, materials engineer, City of Milwaukee Testing Laboratory, in the paper "Design and Control of Paving Concrete." He presented specifications for paving concrete together with design and control methods as practiced by the City of Milwaukee. Compression tests of 3062 test cylinders performed during 1949-53 were summarized, as well as 337 air-content tests begun in 1951.

Considering the quality of the concrete alone, Mr. Burmeister noted that a municipality can issue concrete pavement specifications of either of three main types: (a) simply call for a portland cement concrete pavement of "adequate" or satisfactory quality; (2) stipulate various properties of fresh and/or hardened concrete such as water-cement ratio, compressive strength, mix by volume, or combinations thereof; (3) stipulate batch quantities for a minimum cement factor and a maximum slump.

The third method, which is used by the City of Milwaukee, places the responsibility for concrete quality on the engineers who represent the city and design the mix. He said that this method proved popular with contractors because of the precise bidding basis afforded by the fixed cement content.

In writing specifications for concrete using the fixed cement content the principal steps involved are: (1) selection of cement factor; (2) specifications for cement, fine and coarse aggregate; (3) proportioning mix, and (4) control of concrete in the field.

Pavement joints

E. A. Finney, research engineer, Michigan State Highway Department, East Lansing, and chairman of ACI Committee 325, Structural Design of Concrete Pavements for Highways and Airports, synopsized proposed recommendations for the design of structural details for joints in concrete pavements, which is part of the work of Subcommittee III of Committee 325, in "Recommended Practice for the Structural Design of Joints in Concrete Pavements for Highways and Airports." It included a description, function, and classification of joints, assumptions and materials to be used, and joint details.

Mr. Finney said that it was the purpose of the committee to recommend a practice covering design details for common types of joints in concrete pavements for both highways and airports. It is recognized, he said, that unanimous agreement on all details of the recommended practice is not likely to be obtained. This is due, in part, to variations in conditions, particularly climate and traffic volume, for which provisions must be made in different areas, and in part to the lack of established theoretical guidance coupled with conflicting observations of the performance of similar designs in different localities. Some of the recommendations presented were applicable in certain cases only to highway pavements, others only to airport pavements, and some had application to both types.

The same basic engineering problems encountered in concrete highway paving are encountered in the construction of concrete airport runways. Concrete airport pavements constructed in accordance with accepted standard practices used in highway construction will have similar joint design characteristics. However, in the case of airport pavements, he said, it is necessary to take cognizance of certain factors to satisfy

Darex Diary

by Henry L. Kennedy

Member, American Concrete Institute
Manager, Construction Products
Dewey & Almy Chemical Company

❊ Why air entrainment increases unit weight of mass concrete gravity dams

A QUESTION that I have often been asked is "why use air entrainment in mass concrete gravity dams where weight is a basic requirement?"

Before air entrainment, a four-sack mix for mass concrete was necessary in order to get proper placement, proper consolidation and to minimize segregation and honeycombing. Today, with air entrainment, it is possible to use greater proportions of aggregate per unit of volume, maintaining the same or better placeability and without sacrificing unit weight. Actually, as shown in the following table, the unit weight of air entrained concrete in mass structures is generally greater than the usual mass concrete poured without air.

CONCRETE MIXES

AIR ENTRAINED			**PLAIN**		
C/F	2.5 sks/cu. yd.		C/F	4.0 sks/cu. yd.	
W/C	7.5 gals/sk		W/C	6.0 gals/sk	
Air	3.0% (actual 2.5%)		Air	1.5% (accidental)	
Sp. Gr. F.A.	2.70		Sp. Gr. F.A.	2.70	
Sp. Gr. C.A.	2.78		Sp. Gr. C.A.	2.78	
% F.A./T.A.	19%		% F.A./T.A.	30%	
Batch Wts.		**Abs. Vol.**	**Batch Wts.**		**Abs. Vol.**
Cement	235 lbs.	1.19	Cement	376 lbs.	1.91
Water	156 lbs.	2.50	Water	200 lbs.	3.21
F.A.	726 lbs.	4.30	F.A.	1090 lbs.	6.45
C.A.	3190 lbs.	18.30	C.A.	2605 lbs.	15.05
		0.68			0.41
	4307 lbs.	26.97		4271 lbs.	27.03
Unit Wt.		159.5 lbs/ft.^{3}	Unit Wt.		158.0 lbs/ft.^{3}

Note the decrease in cement content and the greater ratio of coarse to fine aggregate when air entrainment is used. Also note the substantial reduction in water.

However, in average mixes, about 4.5 to 5.5 sacks per yard, air entrainment brings about reduced unit weight; and from a dead-load and transportation cost point of view, this may be considered advantageous. In other words, with little or no effect on the strength factor, the entrainment of air in average mixes reduces unit weight; thus reduces dead-load which has to be carried in the structure and reduces weight which has to be conveyed to the job in a ready mix truck.

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aircraft operations which do not apply to highway pavement.

Highway design takes into consideration not only the magnitude of wheel loads but also the frequency of their application to certain critical locations on the pavement, whereas in the case of concrete runways the repetition of wheel loads is not a major factor in design. In addition, runways must be designed to accommodate wheel loads far greater than those found in current commercial vehicles.

Crack control

"Design of Steel Reinforcement for Crack Control in Concrete Pavements," by Bengt F. Friberg, consulting engineer, St. Louis, synopsized briefly design considerations for distributed reinforcement for crack control, which is part of the work of Subcommittee IV of ACI Committee 325.

He noted that information available to the subcommittee is not sufficient to formulate a recommended practice, but that the considerations were an attempt towards a more realistic analysis of the problem. He devoted attention to characteristics of subgrade frictional resistance and to the relation between steel stress and crack width.

With respect to subgrade frictional resistance, Mr. Friberg emphasized that further information is needed on all variables, effect of magnitude of slab movement, effect of subgrade composition and surface, and effect of slab thickness. The influence of frozen subgrade, adhering to the slab firmly according to small scale tests, can now only be suggested by field data, he said, indicating that winter freezing is not a critical period for crack development.

The need for limiting allowable steel stress to keep cracks below some acceptable maximum width is indicated by conventional bond tests, he noted. The performance of the steel in bond near cracks in pavements slabs, subjected to repeated and progressive influences, may be very different from indications of single pull-out bond tests. Vertical deflections between crack faces, and of abutting slab ends, and crack infiltration, all have effects on the steel, presently unknown but important in design.

He emphasized that additional information is needed before the present design method for distributed reinforcement can be used rationally and with confidence.

Varied (and often unique) construction techniques used in today's concrete projects

Building a roof on the ground, then lifting it into place—sliding forms and prestressing combined in 2,000,000-gal. elevated concrete water tank—three-dimensional "jigsaw" formwork for shell roofs supported at four points—use of prepacked concrete for the encasement of penstocks in hydroelectric power plant construction—were among the unique projects described in the construction session on Wednesday morning. Vice-President Frank Kerekes was session chairman.

Elevated water tank

While more than 700 prestressed concrete underground, surface, and elevated tanks have been built in North America, the 2,000,000-gal. elevated water tank for Dallas, Texas, represents a milestone in prestressed concrete tank construction. It is believed to be one of the largest prestressed concrete elevated tanks built. Furthermore, it is a structural solution in concrete in a field that heretofore had been considered to belong exclusively to steel. J. J. Closner, vice-president, The Preload Co., Inc., New York, and T. Carlweitz, engineer, B. M. Heede, Inc., New York, described design considerations and construction techniques.

The tank is 98 ft 6 in. in diameter with a wall height of 35 ft, resting on a 2 ft thick reinforced concrete slab. Four circular, concentric reinforced walls 83 ft high support the tank and slab. Over-all height of the structure from footings to the top of the 4 in. thick concrete dome is 131 ft 6 in.

Hydraulically raised slip-forms or sliding forms erected the 83 ft high concrete substructure in 126 hr. The lifting rate averaged

8 in. per hr during which time 11 cu yd of concrete and an average of 1000 lb of steel were placed. The tank superstructure was prestressed both vertically and circumferentially. The tank dome required 120 cu yd of concrete, which was placed in one day by pumping it from ground level to tank floor, then to dome height.

One of the interesting innovations on this structure was the use of rubber pads under the wall and under the dome ring, which were provided to minimize the restraint at the edge of the wall during the various loading stages. The wall and/or dome might be said to "float" on the rubber pad.

Mr. Closner stated that by using the rubber pads the following advantages are gained: (1) The known shear resistance of the rubber results in a uniform restraint condition around the tank wall. (2) The rubber begins to deform with the first application of horizontal prestressing and gradually increases with the prestressing, thus preventing development of large bending moments in the wall. (3) Vertical stresses are reduced to approximately 30 percent of those which develop with a lubricated sliding base. (4) The wall thickness is less than with a lubricating sliding base and is usually determined by the circumferential prestressing rather than by the vertical moments. This reduced wall thickness results in smaller stresses due to temperature differential across the tank wall.

Lift-slab construction

B. H. Miller, president, Skyhook Lift Slab Corp., Kansas City, Mo., described lift-slab operations on Ford Motor Co.'s new Rouge Plant office building in Dearborn, Mich., in the report "Youtz-Slick Lift-Slab Method of Construction." In lift-slab or Youtz-Slick method of construction, the upper floor and roof slabs are cast on the ground and then lifted into place by hydraulic jacks. The various slabs are cast and stacked pancake-fashion on the building's floor slab. After the concrete has set, each slab is hoisted into place and secured to the columns. This process is repeated until all slabs are in place and the building looks like a multi-top table.

On the Ford Motor Co. building approximately 400,000 sq ft of concrete was lifted in 4500-sq ft slabs. Mr. Miller noted that lift-slab construction takes anywhere from 50 to 75 percent of the time involved on conventional construction, depending upon the type of job. Several factors other than lifting the slab itself enter into the time saving: (1) vacuum processing enhances the speed and economy by removing excess water and allowing finishing operations in less time while developing ultimate strength of concrete in a shorter time; (2) pumping concrete speeds placement; and (3) 95 percent of the concrete is placed at ground elevation, eliminating much costly and time consuming formwork as well as simplifying placing operations.

Concerning time and cost comparisons on producing structural slabs with conventional or lift-slab methods, Mr. Miller said that during a 40-week period one contractor produced on a conventionally designed building in Kansas City, 530,000 sq ft at an average rate of 13,200 sq ft per week and average form cost of 75 cents per sq ft. On Ford's Rouge Plant building, during a 15-week period 363,000 sq ft of lifted slab were placed for an average weekly production of 24,200 sq ft at a comparable cost of 48 cents per sq ft.

Lift-slab design in flat slab, said Mr. Miller, is highly economical and efficient when the span between columns is from 20 to 24 ft. This distance may be increased to 36 ft by thickening the solid slab to the required depth and by the use of void forms

J. M. Raphael (left), associate professor of civil engineering, University of California, Berkeley, and the chairman of the Technical Activities Committee, Bryant Mather, chief, Special Investigations Branch, Concrete Research Division, Waterways Experiment Station, Corps of Engineers, Vicksburg, Miss., take a "10-minute break" from a convention session

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of plastic or treated cardboard to obtain the required grid for beams which leaves a waffle effect on the underside of the slab. He said that the cost savings achieved by using these cardboard forms on longer spans in lieu of flat slab is approximately 10 percent. He did note that lift-slab construction, like all other methods, has its limitations. Practical experience has limited structures to three stories without splicing the columns and up to eight stories using column splices.

Shell construction

Anton Tedesko, manager, New York office of Roberts and Schaefer Co., and William C. E. Becker, consulting engineer, St. Louis, reported on design and construction problems of the new St. Louis municipal airport terminal. The 450 x 120-ft concourse is roofed by pairs of intersecting thin-shell cylinders of 120 ft span, 32 ft high. The shell roofs are supported at only four points. Two hinged diagonal ribs are provided at the intersection of the cylindrical shells. Peripheral ribs are arranged at the free edges and along the skylights between units.

Centering for the roof construction consisted of highly complex and carefully developed components which had mobility under restricted vertical clearances. The centering was made up of 11 parts, each supported on flanged rollers traveling on rails. Certain of these components were equipped with telescoping posts and two sets of rollers. Depending on the direction of travel, north-south or east-west, one or the other set of rollers was lowered onto the rails. In building each shell, the 11 parts were shifted individually, checker game fashion, until the three dimensional "jigsaw puzzle" was reassembled and concrete could then be placed. The sequence of moving the forms after concreting one shell involved 18 moves to re-erect the forms for another dome.

Prepakt concrete

"Kemano Penstock Tunnel Liner Backfilled with Prepakt Concrete" was presented by R. E. Davis, Jr., and G. E. Wendell, general superintendent and project engineer, respectively, The Prepakt Concrete Co., Cleveland, and G. D. Johnson, general manager, British Columbia International Engineering Co., Ltd., Vancouver, B. C., Canada.

In July, 1954, three generating units were placed in operation at Kemano, B. C., Canada, marking completion of the first stage of construction of a power development for the Aluminum Company of Canada that was a supreme challenge to the capital and courage of private enterprise and the knowledge and skill of engineering and construction personnel.

To generate power for Alcan's smelters at Kitimat it was necessary to build a 324 ft high dam; drive a 10.1-mile, 25-ft diameter, horseshoe tunnel from the dam reservoir through the mountains; construct an 11-ft diameter penstock, 3900 ft long, and $\frac{5}{8}$ in a 48-deg slope; excavate and build an underground powerhouse 700 ft long, 83 ft wide, and 140 ft high; and erect a 50-mile transmission line from Kemano over a 5300-ft pass in the mountains to the smelters at Kitimat.

The authors described the application of prepacked concrete (the Prepakt process) to place 27,000 cu yd of concrete encasement in the penstocks, pitliners, and scroll cases on the Alcan project. The Prepakt process differs from the conventional method of mixing and placing concrete in that the coarse aggregate is preplaced and then consolidated by pumping a fluid sand grout into the voids.

The penstock design on this job utilized the concrete encasement and rock overburden of the penstock tunnel to take the stresses due to hydrostatic load, thus permitting use of a relatively thin steel liner. To achieve this condition it was necessary that the backfill between steel liner and the tunnel rock be substantially free of voids and that the temperature rise produced by the hydrating cement be low.

By means of a "tremie" pipe, coarse aggregate for the backfill was placed down steeply inclined sections so as to fill the space between liner and rock for distances up to 2000 ft. By means of a "rock blower" and conveyer pipe, coarse aggregate was pneumatically transported and placed in horizontal sections for distances up to 600 ft.

Through holes in the steel liner the voids of the coarse aggregate of the backfill were intruded with heavily sanded grout which was pumped horizontally for distances up to 3000 ft and which was pumped upwards

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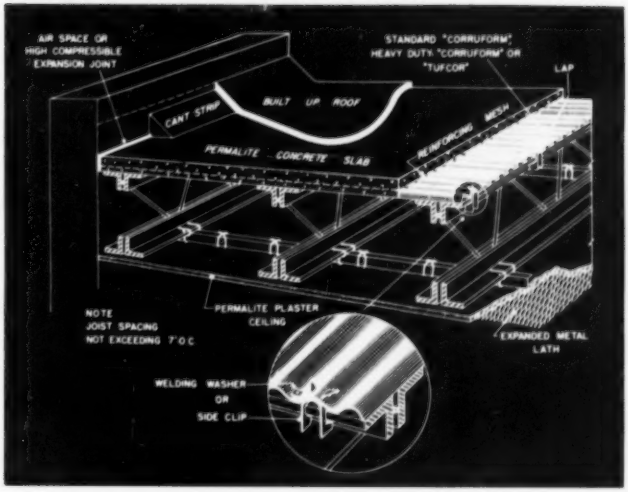

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through differences in elevation of nearly 1500 ft. By such grouting operation, noted Mr. Davis, prepacked concrete containing about 4 sacks of cement per cu yd was produced at a maximum rate of about 600 cu yd per day without delays due to failure of equipment or other cause.

After the prepacked concrete had hardened, 1-in. diameter cores were taken at many of the liner grout holes. These cores, said Mr. Davis, indicated that the backfill was free of voids of significant size and that the only holes which took any measurable quantity of neat grout under high pressure were those in localities were the surrounding rock structure was water bearing or badly fractured.

Physical tests on cylinders and cores indicated that the ultimate compressive strength of the prepacked concrete was generally in excess of 5000 psi.

Inspections by tapping with a hammer after the backfill had cooled and hardened have indicated, he said, that there was complete contact between the liner and the backfill. Penstock pressure tests, made at two stations where the line was $1\frac{5}{16}$ in. thick, under a maximum pressure of 1000 psi maintained for 8 hr, showed that the backfill was carrying 75 percent and the steel liner 25 percent of the water load.

Charles S. Whitney elected president

Charles S. Whitney, partner in the consulting engineering firm of Ammann and Whitney, New York and Milwaukee, was elected president of the American Concrete Institute for 1955 when results of member balloting were announced at the Wednesday noon luncheon. He succeeds Prof. Charles H. Scholer, head, Department of Applied Mechanics, Kansas State College, Manhattan, Kan.

Mr. Whitney is well known for his contributions to reinforced concrete design, particularly in shell construction and other arched structures and ultimate load design.

He received a CE degree from Cornell University in 1914 and his MCE in 1915 from the same school. Following graduation, he held positions with Gustave Lindenthal, New York; and as assistant engineer with John Parkinson, architect, Los Angeles. After serving in the Corps of Engineers during World War I, he was chief engineer to A. C. Eschweiler, architect, Milwaukee, and chief engineer and manager of the Milwaukee office of Hool and Johnson, engineers. From 1922 to date he has been

Retiring President Charles H. Scholer (left) congratulates Charles S. Whitney on his election to the presidency of the Institute

a consulting and designing engineer, specializing in city planning, design and supervision of buildings, bridges, sewer and water systems, defense installations, and other projects.

Honors to Mr. Whitney are many, including the ACI Wason Medal for the most meritorious paper in 1932, "Plain and Reinforced Concrete Arches," and in 1952 as co-author of "Comprehensive Numerical Method for the Analysis of Earthquake Resistant Structures." In 1951 ACI awarded him the Alfred E. Lindau Award "in recognition of his many contributions to reinforced concrete design practice." Other honors include the Fuertes Graduate Medal of Cornell University twice, and the American Society of Civil Engineers J. James Croes Medal.

An ACI member since 1920, Mr. Whitney was elected vice-president of the Institute in 1953, was a member of the Board of Direction 1945-46 and 1950-52, and is a member of ACI's Standards Committee. He is chairman of ACI Committee 312, Plain and Reinforced Concrete Arches, and ACI-ASCE Joint Committee 326, Shear and Diagonal Tension. He is also a member of ACI Committee 214, Evaluation of Results of Compression Tests of Field Concrete, and ACI-ASCE Joint Committee 327, Ultimate Load Design.

Price elected vice-president

Other officers announced were Walter H. Price, head of the U. S. Bureau of Reclamation's engineering laboratories, Denver, for a two-year term as vice-president of the Institute.

A 1930 civil engineering graduate from Tulane University, Mr. Price has been with the Bureau of Reclamation since that year. Since 1934 his work has been devoted to materials testing and research problems related to the construction of dams and irrigation works. Prior to becoming chief of the engineering laboratories he was head of the materials laboratories.

Long active in ACI affairs and technical committees, Mr. Price is chairman of ACI's Standards Committee; ACI Committee 210, Resistance to Erosion in Hydraulic Structures; and ACI Committee 613, Recommended Practice for Proportioning Concrete Mixes. He was a member of the Board of Direction 1951-54. Mr. Price was awarded

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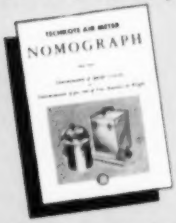

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the Institute's Wason Medal for the most meritorious paper in 1951 for the paper "Factors Influencing Concrete Strength."

Frank Kerekes, dean of the academic program, Michigan College of Mining and Technology, Houghton, elected for a two-year term as vice-president in 1954 continues in that office.

Directors

Elected to three-year terms as directors were H. C. Delzell, managing director, Concrete Reinforcing Steel Institute, Chicago; Thomas B. Kennedy, chief of the Concrete Division, Waterways Experiment Station, Corps of Engineers, Vicksburg, Miss.; Walter J. McCoy, director of research, Lehigh Portland Cement Co., Coplay, Pa.; and Douglas McHenry, director of development, Portland Cement Assn., Chicago.

Nominating committee

The five members elected to the nominating committee were Roy W. Carlson, consulting engineer, Berkeley, Calif.; Joseph DiStasio, DiStasio & Van Buren, engineers, New York; Douglas E. Parsons, chief, Building Technology Division, National Bureau of Standards, Washington, D. C.; Harry F. Thomson, engineering consultant, Clayton, Mo.; and Charles E. Wuerpel, technical director, Marquette Cement Manufacturing Co., Chicago. The remaining three members of the nominating committee are past presidents A. T. Goldbeck, Henry L. Kennedy, and Charles H. Scholer.

Awards announced at annual luncheon

Thomas B. Kennedy, Katharine Mather, Rudolph C. Valore, Jr., and the late Roderick B. Young received ACI Awards from President Charles H. Scholer at the annual Awards Luncheon.

The Henry C. Turner Medal was awarded posthumously to Roderick B. Young "for notable achievements in the development and application of methods of field control of concrete, the development of methods of producing frost resistant concrete, and the development of cold weather concreting techniques." Mrs. Young was present to accept the award.

Mr. Young, research consultant for the Hydro-Electric Power Commission of Ontario, Toronto, Canada, prior to his death last August, was one of the first to use the water-cement ratio theory in the field, applying it to control of quality of the concrete on the High Falls development of the Hydro-Electric Power Commission in 1919. He was actively interested in studies of the durability of concrete in service, as well as other fields including concrete control and inspection, winter concreting, and construction, maintenance, and repair methods.

An ACI member since 1917, and past president of the Institute, Mr. Young was elected to Honorary membership in 1953. In 1937 he was awarded the ACI Wason Medal for the most meritorious paper,

Mrs. Roderick B. Young, who accepted the posthumous award of the Henry C. Turner Medal to Mr. Young, with three of ACI's well-known past presidents: (l. to r.) Harry F. Thomson, Frank H. Jackson, and Herbert J. Gilkey

The three Wason Medalists: (l. to r.) Thomas B. Kennedy and Katharine Mather, awarded the Wason Medal for "noteworthy research," and Rudolph C. Valore, Jr., winner of the Wason Medal for the "most meritorious paper"

"Concrete: Its Maintenance and Repair." He had also received various awards from the American Society for Testing Materials and the American Society of Civil Engineers, and was one of the original organizers of the National Ready Mixed Concrete Association.

The Henry C. Turner Medal was founded in 1927 by the late Henry C. Turner, past president of ACI. It is awarded for notable achievements in or services to the concrete industry.

Rudolph C. Valore, Jr., materials engineer, Building Technology Division, National Bureau of Standards, Washington, D. C., received the ACI Wason Medal for "the most meritorious paper" of ACI *Proceedings* Vol. 50, "Cellular Concretes," which appeared in the May and June, 1954, ACI JOURNALS.

The paper which won the award reviewed methods of preparation and physical properties of moist-cured and high-pressure steam-cured cellular concretes, ranging in density from 10 to 100 lb per cu ft, as they have evolved in Europe in the past 30 years. Data were given for Swedish, Danish, Russian, German, British, and Belgian

ACI past presidents gather with the new president after the Awards Luncheon: (l. to r.) Raymond E. Davis, Frank H. Jackson, Harry F. Thomson, newly-elected President Charles S. Whitney, Herbert J. Gilkey, retiring President Charles H. Scholer, and A. T. Goldbeck

More past presidents—an imposing group: (l. to r.) Douglas E. Parsons, Morton O. Withey, Robert F. Blanks, Harrison F. Gonnerman, Henry L. Kennedy, Raymond E. Davis, and Frank H. Jackson

materials, and for experimental mixtures prepared at the National Bureau of Standards. Various manufacturing processes were also described.

Thomas B. Kennedy and Katharine Mather, chief of the Concrete Division and chief of the Petrography Section, Concrete Research Division, respectively, Waterways Experiment Station, Corps of Engineers, Vicksburg, Miss., were the choice for the Wason Medal for "noteworthy research" reported in the paper "Correlation Between Laboratory Accelerated Freezing and Thawing and Weathering at Treat Island, Maine" which appeared in the October, 1953, ACI JOURNAL.

Six coarse and eight fine aggregates were used in 48 combinations to make concrete specimens, all with the same water-cement ratio, air content, and slump for comparative testing in laboratory freezing and thawing and exposure to natural weathering. The prize-winning paper reported on the two types of exposure, aggregates used, test procedures, and results of dynamic testing of concrete specimens in both exposures. Hypotheses were suggested to explain differences in results in the two exposures.

The Wason Awards were established in 1917 by the late Leonard C. Wason, ACI past president. For material published in the latest volume of *Proceedings* of the American Concrete Institute, an award is made for the "most meritorious paper." The research medal is given for original research work on a subject relevant to Institute activity and which within the *Proceedings* volume year has been the subject of an ACI paper.

Past President Plaques

This year also marked the beginning of a new annual award—a plaque given to past presidents of the Institute in recognition of their services. For this first presentation, of the 19 living ACI past presidents, 11 were on hand to receive the plaque.

Past presidents who were present to accept the award (with year of presidency) were: Robert F. Blanks (1948), Raymond E. Davis (1942), Herbert J. Gilkey (1949), A. T. Goldbeck (1952), Harrison F. Gonnerman (1946), Frank H. Jackson (1950), Henry L. Kennedy (1953), Douglas E. Parsons (1945), Harry F. Thomson (1951), Morton O. Withey (1943), and, of course, retiring president Charles H. Scholer.

Past presidents awarded plaques but unable to attend the Milwaukee convention were: Duff A. Abrams (1930-31), Phaon H. Bates (July 1934-Feb. 1936), S. C. Hollister (1932-33), Arthur R. Lord (Feb.-June 1934), Franklin R. McMillan (1936), Adm. Ben Moreell (1941), Maxwell M. Upson (1926-27), and Stanton Walker (1947).

Past Board service

Retiring members of the Board of Direction were given certificates in recognition of their services. A certificate of service went to Harry F. Thomson, director 1939-40 and 1942-48, vice-president 1949-50, president 1951, and past president 1952-54. The

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Board of Direction at its meeting earlier in the week adopted a resolution thanking Mr. Thomson for his long and valuable service on the Board and expressing appreciation for his counsel and assistance in reaching solutions to important problems before the Board. Directors who had served 1952-54, A. Allan Bates, J. W. Kelly, F. N. Menefee, and Bailey Tremper, were also given certificates.

ACI names Jackson and Stanton honorary members

President Charles H. Scholer at the Awards Luncheon announced the election to ACI honorary membership of Frank H. Jackson, engineering consultant, Washington, D. C., and Thomas E. Stanton, formerly materials and research engineer, California Division of Highways, Sacramento.

Mr. Jackson, formerly principal engineer of tests, U. S. Bureau of Public Roads, in a public career spanning 48 years, has contributed greatly to the knowledge of the materials, testing techniques, and construction methods related to concrete pavements. For his outstanding work in the highway field he was awarded the Distinguished Service Award of the Highway Research Board in 1948 and in 1959 he received the Meritorious Service Award of the U. S. Department of Commerce. Author of numerous JOURNAL papers, he was awarded, with H. W. Allen, the ACI Wason Medal for the most meritorious paper in 1948 for "Concrete Pavements on the German Autobahn." Active in ACI affairs since 1924, he was Institute president in 1950, and has served on numerous ACI technical and administrative committees.

Mr. Stanton served the State of California for 39 years in several different capacities, terminating in 1951 as materials and research engineer. He is perhaps best known to the engineering profession for his work in portland cement concrete, and particularly for his studies of the alkali-aggregate reaction. He originated the sealed contained mortar bar test and was the first to establish a limit for alkalies in portland cement for use with reactive aggregates. He made exhaustive studies in an effort to find inhibitors for the alkali-aggregate reaction and was one of the first to note the beneficial effect of pozzolans in this connection. He was awarded the ASCE Norman Medal in 1943 for this work.

His important special investigations dealt with the service of special and standard types of cements, impervious membrane method of curing pavements, durability of concrete under alkali and accelerated weathering conditions, and many others. With Lester C. Meder, he was awarded the ACI Wason Medal for noteworthy research for work reported in the 1938 paper "Resistance of Cement to Attack by Sea Water and by Alkali Soils." In all, he has contributed 14 papers on various subjects to the ACI JOURNAL. Active in ACI affairs and committees, he had also served on the Board of Direction.

President Scholer looks to the future

In his address at the Awards Luncheon, retiring President Scholer looked ahead to ACI's second 50 years. He emphasized that "...we should keep in mind that the really difficult things to achieve, the significant policies to be carried out, are substantially the same even though the means of executing these policies and projects may change." (See p. 733 of this month's JOURNAL for complete address.)

One point that President Scholer stressed was that of continued vigilance, on the part of the Institute through its committees and publications, in seeing that established practices of good concrete construction were constantly reaffirmed. He laid emphasis on the fact that prominent and respected persons in the concrete field were often in need of a reminder of established fundamentals. "The *Concrete Primer*..." he said,

"should be re-read not only by the younger members ... but particularly by eminent consulting engineers, administrative officials in high positions in major construction companies, and world-famous supervising architects."

President Scholer discussed the part to be played by recently formed concrete improvement groups. He expressed regret that the necessity for such groups existed but congratulated the men who had seen a bad situation and had taken steps to improve it.

President Scholer described the inspector or resident engineer as the key man in securing good concrete construction. He expressed hope that these men, who hold the major share of responsibility for good construction, be given adequate respect and esteem—and remuneration. He emphasized that men in positions of authority were the ones to take the steps toward making concrete of the quality the industry is capable of producing.

Structural design and research in concrete

The design and research session on Wednesday afternoon, under the chairmanship of Charles S. Whitney, delved into data on shear strength of reinforced concrete beams, lapped splices of reinforcement in concrete beams, strength of reinforced concrete T-beams, and shell design.

Shear strength of beams

"Shear Strength of Reinforced Concrete Beams," by K. G. Moody, research engineer, Bridge Division of the Country Roads Board, Victoria, Australia; I. M. Viest, research assistant professor of theoretical and applied mechanics, University of Illinois, Urbana; R. C. Elstner and E. Hognestad, respectively associate development engineer and manager, Structural Development Section, Portland Cement Assn., Chicago, was presented by Professor Viest.

The problem of the strength and behavior of reinforced concrete beams subject to combined shear and flexure has been the subject of numerous experimental investigations. Nevertheless, recent studies indicated that available experimental data on diagonal tension and shear were inconclusive and inadequate for predicting ultimate strength, particularly for restrained beams. A cooperative investigation was started in 1950 at the University of Illinois under the sponsorship of the Reinforced Concrete Research Council and the U. S. Bureau of Public Roads. (The results of these studies have been reported in a recent series of papers in the ACI JOURNAL).

The effect of shear on the behavior of reinforced concrete beams was summarized by the authors as follows:

If the nominal shearing stress exceeds a certain value, major diagonal tension cracks form and the internal stress distribution is changed. Further increases of load are possible only if a new equilibrium of internal and external forces can be reached; otherwise the diagonal crack formation represents the ultimate load condition. If, however, a new statistical equilibrium is reached and the beam sustains further increases of load, the failure occurs by destruction of the compression zone of concrete above one diagonal crack. The corresponding load is governed by the shear moment capacity.

Since the formation of a diagonal crack may represent failure in some cases and since the formation of a diagonal crack is independent of the web reinforcement, it appears that a rational and economical design procedure for shear should be based on two independent criteria: one guarding against failure by diagonal crack formation and the other against failure by destruction of the compression zone.

The existing specifications, said the authors, do not recognize the basic difference between diagonal tension crack formation and the final shear failure. Thus the concepts of the shear requirements may have to be revised especially if a transition is made from the working load design to the ultimate load design. However, additional studies dealing with different loading conditions and types of cross section should be made before em-

barking on any radical changes of the existing design procedures, they emphasized.

Lapped splices

"Lapped Splices in Reinforced Concrete Beams," by James Chinn, assistant professor; Phil M. Ferguson, professor and chairman; and J. Neils Thompson, professor; Department of Civil Engineering, University of Texas, Austin, was presented by Professor Chinn.

Recent research with eccentric pull-out tests and beam tests indicated low bond resistance in situations where longitudinal splitting of the concrete was not prevented. This led to concern for splices where restraint against splitting often does not exist.

The splice tests reported by the authors were designed to be representative of such tension lap splices as might occur in joining precast beams in negative moment regions. For this reason, small aggregate, high concrete strength, and low slump were used. The tests were planned as pilot tests to investigate as many variables as possible and to establish trends rather than precise values.

However, the authors reported that some definite conclusions seem warranted. (1) All splices failed with a splitting failure, usually at relatively low and unsatisfactory stresses. (2) Splices cast in the top of beam were only some 3 percent to possibly 8 percent weaker than bottom bar splices, probably due to the small water gain with vibrated concrete of near zero slump. (3) Stirrups or ties around a splice increased its strength more than 45 percent. (4) If no special limitations are placed on beam width, bar cover, or the use of stirrups, the design will not always give a factor of safety of 2.5 unless the bond stress is limited to 175 psi (for $f_c' = 4500$ psi), that is, to half the present 350 psi allowable.

Strength of T-beams

"Strength of Reinforced Concrete T-Beams under Combined Direct Shear and Torsion," was covered by Earl I. Brown, II, head, Department of Civil Engineering, Alabama Polytechnic Institute, Auburn, Ala.

Tests on longitudinally reinforced concrete sections without web reinforcement were reported. Strength of reinforced concrete T-beams in combined direct shear and torsion were compared to the strength of similar sections in direct shear alone. Professor Brown noted that theoretical torsion strengths, based upon plastic theory, were in fair agreement with experimental results at first diagonal cracking but are on the safe side.

There is no conclusive proof, said Professor Brown, that reinforced concrete in combined direct shear and torsion follows a particular criterion of failure. The generally accepted practice in design is to assume the maximum stress criterion, and this was accepted for the study of the various sections of longitudinally reinforced concrete beams in combined direct shear and torsion.

The ultimate load of the beam loaded in direct shear alone was assumed to be a measure of the ultimate tensile strength of the concrete in each test group. Cracking loads of the beams in combined direct shear and torsion were accepted as critical loads because of the characteristics of plain concrete in torsion and because of strain characteristics of the test specimens. Nevertheless, said Professor Brown, combined loads and torques causing diagonal cracks were found to be only some 66 percent of the ultimate loads under combined direct shear and torsion.

Calculated combined stresses at first diagonal cracks when torsion calculation was based on elastic assumptions, were found to average 160 percent of ultimate tensile strength, he said. When torsion was based on plastic assumptions, these stresses were found to average 116 percent of ultimate tensile strength. Calculated combined stresses at ultimate loads were similarly 240 percent and 173 percent of the ultimate tensile strength.

The deflection, rotation, and strength characteristics of these test specimens indicate, reported Professor Brown, that maximum strength may be limited by a maximum rotation rather than by a maximum stress when torsion is of an important magnitude.

He believed that the plastic theory gives more reasonable results in predicting the cracking strength under torsion or combined direct shear and torsion for concrete members than does the more generally used elastic theory.

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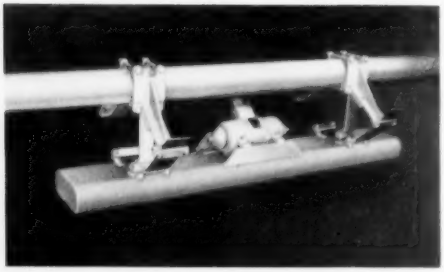

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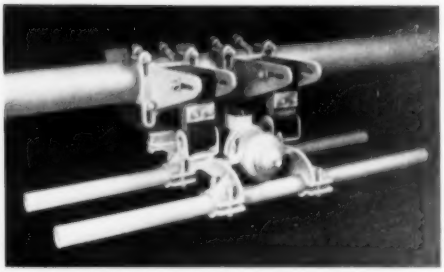

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Eliminates manual vibrating of concrete at side forms. Saves the better part of two men's labor. Mounts on any modern finisher or spreader. Employs two or more vibratory units that are simultaneously lowered into or raised from the concrete by finisher operator. Units operate close to forms or reinforcement. Will not snag or penetrate into sub-base. Assures perfect compaction regardless of speed of finisher or spreader.

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Thin-shell design

"Live Load and Temperature Moments in Shells of Rotation Built into Cylinders," was discussed by Mario G. Salvadori, professor of civil engineering, Columbia, University New York.

Thin shells of reinforced concrete in the shape of surfaces of revolution have been used in the United States for some time and are becoming standard structural elements in a variety of applications. Professor Salvadori presented tables for the maximum bending moments due to vertical live loads and temperature variations in shells of revolution of a large variety of shapes (including spherical, conoidal, and elliptical domes) when the shells are elastically built-in into cylinders of the same radius, as is the case, for example, in vertical tanks. He pointed out that under certain conditions, the maximum values of the bending moment in the shell and in the cylinder are only a function of the ratio of thickness of shell to thickness of cylinder.

Equipment development keeps pace with needs of concrete construction industry

The manufacture of concrete and the concrete construction industry are big business. Along with structural design, methods of manufacture, and building techniques, the equipment being used is constantly under study—aimed at two things: improvement of quality of concrete and structures and reduction of cost. One of the concurrent sessions on Wednesday afternoon was devoted entirely to some of the latest developments in concrete construction equipment. Walter H. Price was session chairman.

Concrete mixers

"More Efficient Concrete Manufacture," was the topic of Glenway Maxon, consulting engineer, Milwaukee.

The art of mixing concrete starts with the efficient handling of materials. Mr. Maxon discussed mixing and concrete mixers with an aim toward quality concrete and greater economy. He covered ways to effect greater efficiency in selecting mixer sizes and by mixing plant layout.

The actions that aid mixing most, pointed out Mr. Maxon, are those which divide, knead, roll, and re-unite the material with other parts of the ingredients. Generally speaking, he said, high velocity of the mixer with sudden changes from slow to fast, or fast to slow, tends to segregate the material in the mixer. Likewise, he said, after wetting and shrinkage has taken place, concrete dropped causes mortar to splash out and away while the heavy particle remains close to the point of impact. This lifting and dropping has the added undesirable feature of increasing breakage and grinding.

Mixing time can be reduced, he noted, if the various concrete ingredients are blended as they enter the mixer. He felt that this blending or collection and feeding of ingredients in desirable sequence had a decided effect upon the length of time necessary to complete the mix.

In reference to the blading, he believed it was desirable that each set divide the concrete into the greatest number of paths in the mixer. A system of blading which effectively divides the ingredients in the greatest number of ways should result in mixing in the shortest time, he said. However, Mr. Maxon pointed out, it has been found that blading suitable for one type of concrete may not act efficiently on another. Large aggregate, manufactured by crushing, adheres to the blade through a greater part of its arc of travel than well rounded gravel.

In addition to attempts made to save time in the mixer, we should consider, said Mr. Maxon, a more logical formula for the length of mixing time for various size mixers of homologous construction. He believed that the proper length of mixing time should be the minimum at which wash-out tests or any other acceptable mixer efficiency tests indicate the concrete has arrived at its designed strength, air content, and any other characteristics in the specifications. He believed that

the length of time required for mixing should not be a direct function of the size of the batch but should vary as the length of the paths of the various ingredients, or, in other words, as the diameter or length of the drum, for it is distances not volumes that determine the time for divisions and uniting of the streams of mixing.

In reference to mass concrete, using large size aggregate, he believed it desirable to mix in steps or stages. Using two mixers, one mixer would mix the ingredients up to and including 1½-in. aggregate and discharge this mixed concrete into one end of a double-end mixer twice its size at the same time this larger mixer is charged with the large size aggregates at the opposite end of that mixer. This would lead to quality concrete and greater mixer efficiency at reduced plant cost, he said.

Slope paving

"Better Concrete in Slope Paving by Use of Slip-Forms," by William J. Robinson, engineer, U. S. Bureau of Reclamation, Cachuma Project, Goleta, Calif., and Lewis H. Tuthill, concrete engineer, U. S. Bureau of Reclamation, Denver, was presented by Mr. Tuthill.

Unformed, sloping areas of concrete placed in reservoirs, canal lining, spillway floors and intakes, and embankment protection are often poorly consolidated and irregularly surfaced. Poor consolidation usually comes about because the slopes are too flat to use conventional forms to hold the concrete during vibration—and without forms, vibration of plastic mixes of intermediate slump sufficient to consolidate the mix at subgrade, causes the concrete to flow down the slope. Consequently, vibrators are sparingly used, giving poor consolidation through the slab. Even with inadequate vibration there is often enough sag to cause an irregular surface.

Fortunately, reported the authors, there is an easy way to obtain and insure good results economically. They went on to describe an efficient, simple strike-off slip-form for placing well-consolidated, accurately-surfaced concrete on slopes too flat to form. The slip-form strike-off holds the concrete temporarily while it is being vibrated. At the same time, it shapes and evens the surface, reducing hand work necessary to leave an acceptable finish.

Mr. Tuthill believed that there were three principal advantages of using a slip-form instead of ordinary strike-off and compaction methods. (1) Either plain or reinforced concrete can be consolidated thoroughly by vibration along the header board without fear of swelling or sagging in the slab below. (2) With either plain or reinforced concrete, a solid, accurate surface is produced which requires comparatively little further finishing for most purposes. (3) Labor is saved in strike-off and finishing operations and progress is usually increased sufficiently that unit placing costs are lower.

He then described some examples of typical successful use of slip-forms including lining of the Gobernador reservoir, lining of the Pole Hill power canal, floor slab of the Kirwin Dam spillway, and lining of the Carpinteria and Ortega reservoirs.

In many cases, he said, slip-forms like those described have been found helpful in laying relatively level slabs in canal or reservoir bottom areas although for horizontal work, because sagging and swelling is no problem, vibrating strike-off beams without a slip-form pan can also be used effectively.

Moisture meter

Another relatively new piece of equipment was described by C. B. Van Alstine, concrete engineer, Board of Water Commissioners, Denver, in the report "Use of an Electrical

ACI Director H. C. Ross (left), assistant director of research, Hydro-Electric Power Commission of Ontario, Toronto, talks it over with H. K. Cook, assistant director of research, Master Builders Co., Cleveland

Resistance Moisture Meter at Reservoir Dam 22, Denver."

Conditions on Denver's Reservoir No. 22 Dam created severe fluctuations of free moisture in sand and pea gravel going into the concrete. These changes in moisture came suddenly with no advance warning and made it difficult to batch consistently. Thus 50 to 100 batches a day were potentially so variable in moisture content as to seriously jeopardize uniformity of the concrete.

To correct the various batches, it was necessary to know the amount of free moisture in the materials. It was found that quick and fairly dependable moisture determination could be obtained by using a special electrical resistance meter. Essentially the unit consisted of a meter box connected to stationary electrodes placed in the sand hopper. The electrical resistance of the sand between the electrodes was recorded and converted into percent free moisture on the indicator chart. The meter was placed in the batching plant control room and consulted by the operator as each batch was weighed.

After the free moisture content of the materials has been determined the operator consults a moisture correction chart for correct batch weights of water, sand, and aggregates. One of these charts was prepared for each mix.

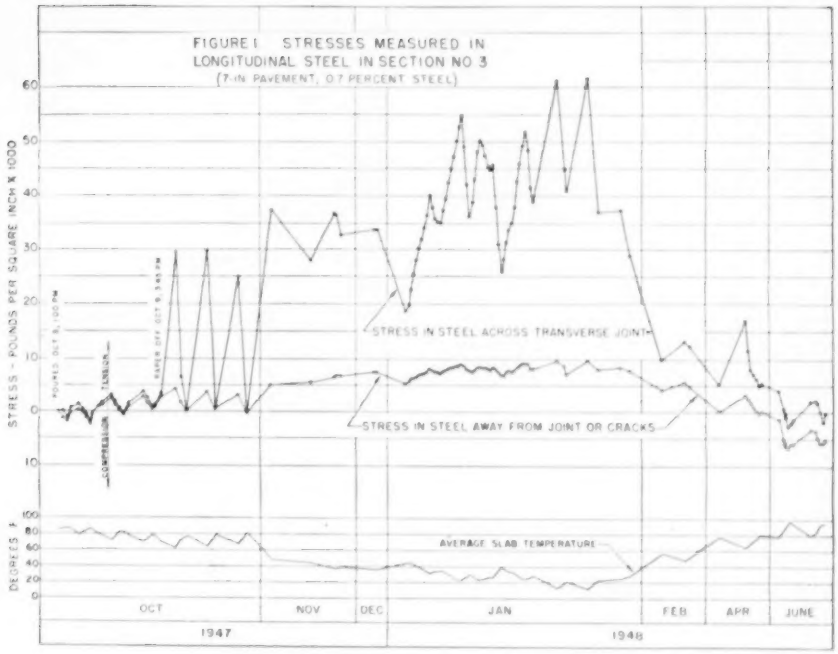
Mr. Van Alstine noted that the moisture meter is not infallible nor free from mechanical failure, but its dependability is good within normal ranges of moisture fluctuations. Severe fluctuations of moisture indicated on the moisture meter, he said, have been sufficient warning to batch plant inspectors to correctly estimate and subtract as much as 300 lb of water from one batch to the next and still stay within the desired slump range.

The moisture meter, together with separation of aggregates into five sizes, finish screening of coarse aggregate at the batch plant, weigh batching, mixer performance tests, quality control methods, and other elements in establishing rigid production control, was a key factor, said Mr. Van Alstine, in obtaining a degree of uniformity which lead to reducing the cement content of the interior mix for the dam from 3 sacks per cu yd to 2½ sacks per cu yd. This resulted in a savings of approximately $270,000 for the remainder of the job.

Batching plants

"Testing of Batching Controls and Recorders for Concrete Plants," was presented by W. L. Burgess, Concrete Control Branch, Engineering Division, Civil Works, Office of the Chief of Engineers, Washington, D. C., and C. H. Willets, Concrete Division, Waterways Experiment Station, Vicksburg, Miss.

During late 1953 and early 1954, a test program sponsored by the Corps of Engineers was conducted at the Concrete Division Laboratory of the Waterways Experiment Station to obtain performance data on commercially available batching controls and recorders for concrete batching plants. The authors reported briefly on the test data.



70° temperature drop and 62,400 psi stress

didn't faze the RAIL STEEL bars in this continuously reinforced concrete road.

Just west of Vandalia, Illinois on U.S. 40 is a stretch of continuously reinforced concrete pavement, 3500 feet in length. Constructed in 1947, this road was subjected to a series of tests which measured the stresses set up in the reinforcing bars during the temperature changes of the following year.

The chart* illustrates the steel stresses in excess of 60,000 psi that occurred during the sub-freezing weather. The Rail Steel bars withstood this severe test and demonstrated their effectiveness in reinforcing smooth-riding, low-maintenance, jointless concrete pavements. During seven years of normal use, there has been no visual residual elongation or corrosion damage on this section of road.

High strength Rail Steel reinforcing bars are rolled with crack-controlling deformations to meet ASTM Specification A-305 and are readily available in all sections of the U.S. For additional information on Continuously Reinforced Concrete Pavements write Rail Steel Bar Association, 38 S. Dearborn Street, Chicago 3, Illinois.

Available now for showings: 16mm. color film, "Rail Steel in the World of Today"

*From a report by H. W. Russell in Proceedings of Concrete Reinforcing Steel Institute, 7-14-49.

Accuracy in batching is essential to the production of uniform concrete. An accurate recorder is desirable for most concrete plants because (1) it can serve as a continuous indicator of batching conditions, and (2) it can provide a permanent record for payment and for determining compliance with specified proportioning.

Six simulated concrete mixtures were used to represent batches containing two size-groups of coarse aggregates, three size-groups of coarse aggregates, and four size-groups of coarse aggregates. The size of batches ranged from 1 to 2 cu yd. The equipment was tested only for its accuracy in weighing and recording the cement and the fine and coarse aggregates. Not less than 500 batches were produced in testing each manufacturer's equipment.

The equipment was tested in a cumulative-weighing type of plant. However, said Mr. Burgess, all equipment tested was considered satisfactorily adaptable to either a cumulative-weighing type of plant or an individual-weighing type.

As a result of the investigation, he said, clarification of the intent of Corps of Engineers guide specifications was achieved with respect to a better presentation of the detailed requirements for accuracy of equipment for weighing and recording materials for concrete. The investigation produced data which resulted in revisions to Corps guide specifications to permit more practical contract applications.

Annual research session

Research techniques and preliminary results of investigations were presented in a group of ten papers at the annual open session of ACI Committee 115, Research, Thursday afternoon. Stephen J. Chamberlin, chairman of Committee 115, served as session chairman, and George W. Washa, secretary of the committee, served in that capacity for the meeting.

This convention feature differs from general sessions in that the information is not released for publication, and the "off-the-cuff" reports are regarded as confidential. The organizations concerned have released the following brief summaries for publication in the ACI JOURNAL.

Initially retarded concrete

"Properties and Uses of Initially Retarded Concrete" was discussed by Lewis H. Tuthill and William A. Cordon. Loss of slump and workability and higher water requirement, particularly in warm weather, often impair quality of concrete. Investigation of corrective agents included development of a penetration resistance test to measure rate and progress of hardening, which was described. The effect of various factors, such as temperature, character and amount of cement, and type and amount of retarding agent on rate of hardening, early strength, water requirement, and durability, were reported.

Set retarding admixtures

"Test Results Including Long-Time Data on Concrete Containing Set Retarding Admixtures" was by W. J. McCoy and S. B. Helms. This study indicated that it is feasible to delay the placing of concrete up to 18 hr by the addition of inorganic retarders up to 0.5 percent based on weight of cement. Strength tests, including fog room and outdoor exposure conditions, some of which are at ages to 20 years, show the retarders to have no appreciable effect on strength except at very early ages in those cases where marked retardation would permit placing of concrete more than 5 hr after mixing. Concrete beam specimens, containing the retarders, exposed to severe natural weathering for a period of 6 years have not shown any significant signs of inferior durability.

Flexural strength

"Factors Affecting Measured Flexural Strength of Concrete" was the topic of Delmar L. Bloem. The investigation was initiated to provide information, apparently lacking in previously published literature,

Research projects compiled by Committee 115

The assignment of Committee 115, Research, "is to review and correlate research in concrete and reinforced concrete and to consider research methods and objectives." The committee has attempted to fulfill this assignment through the research sessions at the annual conventions, through the distribution of the annual compilation of research projects under way at the various laboratories, and through limited correspondence among committee members.

The annual compilation for 1955 is divided into three parts. The first part gives the names of all educational institutions that are carrying out concrete research and lists the projects that they are working on. The second part provides similar information for non-educational organizations. In the third part the projects are classified under subject headings.

This year, 80 organizations from all parts of the United States and from several foreign countries reported to the committee. These organizations included universities, highway departments, federal departments, cement companies, industrial laboratories, commercial laboratories, and various associations. The reporting organizations listed 548 different projects under way.

Research in plain concrete and materials includes abrasion and wear, admixtures, aggregates, air entrainment, alkali-aggregate reaction, cement, chemical attack, creep (plastic flow), curing, dams, dynamic properties, elastic properties, fatigue, freezing and thawing, lightweight concrete, masonry, mass concrete, mix proportioning, mixing and placing, mortar and grout, pavements, permeability and absorption, strength properties, testing methods, thermal properties, volume changes, and workability. Projects in reinforced concrete include beams, bond, bridges, columns, creep, deflection and cracking, design, dynamic properties, fatigue properties, fire resistance, frames, lightweight concrete, precast concrete, prestressed concrete, reinforcement, shear and diagonal tension, shells and domes, slabs, tanks and pipes, and walls.

Probably the greatest use of the compilation will be to facilitate the exchange of research results and to further research by avoiding duplication and encouraging correlation of work. Those planning research are urged to register their project and secure information already developed, perhaps not yet published, to aid their planning.

For those who did not secure a copy of the compilation at the Milwaukee convention, additional copies are available from ACI headquarters.

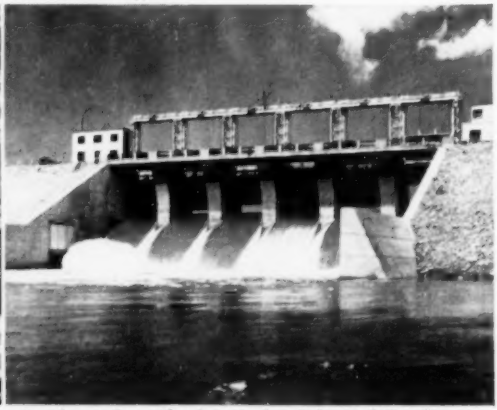
From the continuing interest of the ACI membership in the activities of Committee 115, it is evident that real needs are being satisfied. It would be presumptuous, however, to assume that the committee has reached the zenith of its possible usefulness; there must be various ways in which increased service can be rendered. Your reactions and suggestions in this connection are earnestly requested. Since the committee is anxious to have complete coverage of all research projects in its next compilation, all persons having suggestions or knowing of omissions are urged to initiate correspondence at once. No information will be given any publicity without the permission of the correspondent. Address your suggestions and inquiries to:

Prof. George W. Washa
Secretary, ACI Committee 115
Engineering Bldg., U. of Wisconsin
Madison 6, Wis.

Central Hudson Gas and Electric Corp. Power Plant, Newburgh, N. Y. Engr.—Burns and Roe, Inc., New York, N. Y.; Contrs.—Drill-In Caisson Corp., New York, N. Y. and G. E. Campbell, Poughkeepsie, N. Y.

Kansas City Water Softening Plant, Kansas City, Mo. Engrs.—Burns & McDonnell Engr. Co. and Black & Veatch Engr. Co.; Contr.—S. Patti Constr. Co.—all of Kansas City, Mo.

City Park Garage, Pershing Square, Los Angeles, Calif.; Archt.—Stiles Clements, Associated Architects & Engineers; Consltg. Engr.—Murray Erick Associates; Contrs.—Ford J. Twaits Co.; Morrison-Knudsen Co., Inc.; and T-S Construction Engineers, Inc.



Fanshawe Dam, Flood control unit located 15 miles northeast of London, Ontario. Consulting Engineers—H. G. Acres & Company, Niagara Falls; General Contractors—Foundation-Mannix Ltd., Toronto.

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on factors related to the production of the high flexural strength concrete required by many recent specifications for highways and airport runways. Major portions of three phases of the study have been completed, involving the following variables: different aggregate types; a wide range in cement factors; air-entrained and non-air-entrained concrete; different test ages; variations in maximum size of aggregate; and different sizes of flexural test specimens. Principal results of tests so far completed were reported.

Water vapor diffusion

"Measurement of Water Vapor Diffusion in Hardened Portland Cement Paste" was discussed by Harry Mann. Experimental data on moisture movement through hardened paste are being obtained. Test specimens are exposed to water vapor over a salt solution on one side and to CO_2 free air and controlled water vapor pressure on the other. The salt solution is in a metal cell, the test specimen serving as a cover. Periodic weighings indicate the rate of moisture transfer through the test specimen. Factors under study are moisture gradients corresponding to different relative humidities, drying and resaturation, and temperature. Data were interpreted in terms of porosity, internal surface area, and other characteristics of the paste.

Carlson stress meters

"Tests of Carlson Stress Meters" was presented by Thomas B. Kennedy. Loading tests were made in compression at the Waterways Experiment Station and checked at the University of California on 30-in. diameter, 60-in. long concrete cylinders containing two Carlson stress meters and five Carlson strain meters to verify the behavior of the stress meters under known increments of load. The results indicate that the meters will register stress directly within practicable limits of accuracy.

Deep beams

"Deep Beams of Reinforced Concrete—Theory and Tests" was by G. R. Swihart. Reinforced concrete beams with a depth to span ratio of ½ and 1 and with varying percentages of longitudinal and diagonal tension steel are being tested. The span length is 60 in., the width is 3⅝ in., and the load is concentrated at the center. Deflections and strains due to flexure, shear, and diagonal tension are recorded at intervals up to the ultimate load. A correlation between test and theory is being developed for both the elastic and ultimate load concepts.

Eccentrically loaded columns

"Investigation of Eccentrically Loaded Reinforced Concrete Columns Subject to High Sustained Loads," by Richard C. Elstner, was concerned with the effect of time on the strength of eccentrically loaded reinforced concrete columns. Specifically, it was desired to obtain experimental data on the maximum load which an eccentrically loaded reinforced concrete column can sustain indefinitely and to study the behavior of columns under such high sustained loads. Forty-four columns with two types of eccentricity were tested as a part of this investigation. All columns were rectangular 5 x 5 in. in cross section reinforced with four #4 bars. Three variables were included: the eccentricity (3.75 6.12 in.), the strength of concrete (2000, 3500, and 5000 psi), and the method of loading. Short-time tests and long-time tests lasting up to 880 days were made. The investigation was carried out as a cooperative project between the Reinforced Concrete Research Council and the University of Illinois. It came as an outgrowth of a theoretical and experimental study of the short-time strength of eccentrically loaded columns completed recently by the same agencies.

Other papers

In addition to the above mentioned papers, George L. Kalousek spoke on "Transformation in the Crystal Structure of Concrete Binders as Related to Drying Shrinkage;" S. W. Benedict spoke on "Development of Apparatus and Methods of Test for Determining Abrasion and Spark Resistance of Industrial Concrete Floors;" and W. R. Schriever spoke on "Loading Test of a Continuous Two-Span Prestressed Concrete Beam of 100-ft Length." Additional information on these projects is not available for release at this time.

Tours and social events

Along with the technical sessions, the 51st Annual Convention also featured inspection tours and entertaining social events. The Milwaukee convention committee handled arrangements for the various events.

Highlight of the social events was the dinner on Wednesday evening, with A. Allan Bates serving as toastmaster. ACI was welcomed to Milwaukee by Mayor Frank P. Zeidler. Mayor Zeidler discussed civil defense planning in general and as related to Milwaukee. He emphasized the role that engineers should and must play in civil defense planning and execution. Featured speaker was Harry C. Brockel, municipal port director, City of Milwaukee, who discussed the impact of the St. Lawrence Seaway on the Midwest.

Mr. Brockel estimated that construction of the Seaway will stimulate about $1 billion of construction during the next 5 years. He said about $300 million will be spent for navigation improvements, $500 million for power development, $100 million for channel deepening, and $100 million for port and harbor improvements by Great Lakes cities.

In describing the vastness of the program, Mr. Brockel said the over-all program will involve such quantities as 5,400,000 cu yd of concrete, 66,000 tons of reinforcing steel, 47,000 tons of structural steel, 100,000,000 cu yd of dredging, and 180,000,000 tons of earth and rock excavation.

He said Milwaukee has already spent more than $10 million for construction of port facilities and that the city plans to spend another $5 million during the next 5 years on harbor facilities.

Thursday morning was devoted to tours of construction equipment manufacturing plants—Allis-Chalmers Manufacturing Co., Chain Belt Co., and A. O. Smith Co.

On Tuesday evening two of the local breweries, for which Milwaukee is famous, conducted tours through the plants and furnished "refreshing" entertainment.

Ladies program

For the 75 ladies attending the convention, the Milwaukee committee arranged various special events. A coffee hour was held every morning. Tuesday's schedule included a trip to the fabulous new Jewish Welfare Center on the shores of Lake Michigan; luncheon at the center with Sister Thomasita, art director of Cardinal Stritch College, as guest speaker; and a visit to the Layton School of Art. Wednesday's featured attractions were a tour through the Robert A. Johnston Co. and a luncheon style show. Edith Quade, of Milwaukee Public Museum, was the guest speaker and spoke on "Wisconsin Folkways and Byways."

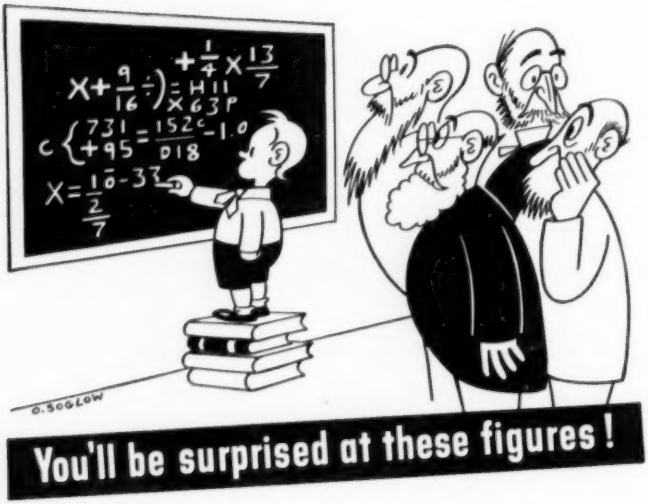
Equipment displays

The equipment exhibit was another outstanding feature of the 51st Annual Convention, and was well attended at almost every hour of the day. Each exhibit was manned by courteous company representatives and had available informative material such as catalogs, specifications, and technical literature. Twenty-six organizations were represented and included the following.

American Concrete Pressure Pipe Assn., Chicago, Ill.—Photographs showed installation of concrete pressure pipe. A cut-out section of reinforced pressure pipe was displayed.

American Instrument Co., Inc., Silver Spring, Md.—A display of Aminco test instruments for cement and mortar. It included an Aminco cement autoclave which features a boiler tested to 1000 psi pressure, two built-

Random shots taken around exhibit area



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in heaters, and a blower which cools the autoclave to room temperature in an hour.

Butler Bin Co., Waukesha, Wis.—Special feature of the exhibit was an electronic control board for batching plants. Literature on Butler portable batching plants described erection and operation. Information was also given on specialized construction equipment.

Calcium Chloride Institute, Washington, D. C.—Information was given on the proper use of calcium chloride in concrete both in standard solution and flake form. Illustrations showed construction projects throughout the country where calcium chloride was used.

Cen-Vi-Ro Pipe Corp., South Gate, Calif.—Illustrations showed steps in the manufacture of Cen-Vi-Ro reinforced concrete pipe, namely, centrifugal compaction, consolidation by vibration, and pressurization with rollers and high-strength steel wire. Internal pressure tests and external bearing tests were performed on the pipe.

Chain Belt Co., Milwaukee, Wis.—Illustrations and literature on Rex mixers, truck mixers, and pavers. Rex Pumperete process was pictured and described. A tour through the Chain Belt Co. plant in Milwaukee was part of the convention schedule.

Chicago Fly Ash Co., Chicago, Ill.—Illustrations showed how fly ash is produced as a byproduct of an electric power station. Information was given on how fly ash is used in concrete.

Copperweld Steel Co., Warren, Ohio—Webrib high-bond steel reinforcing bars were featured. Photographs illustrated the installation of Webrib bars.

Felker Manufacturing Co., Torrance, Calif. (represented by Prime-Best Inc.)—Models 100 and 200 Felker concrete cutting machines were displayed. Both featured the Felker Di-Met segmented diamond cutting wheels.

Gar-Bro Manufacturing Co., Los Angeles, Calif.—Featured was the Gar-Bro Power-Cart, a gasoline powered concrete buggy. Motion pictures showed the Power-Cart in operation. Literature on Gar-Bro buckets and other products was offered.

Granco Steel Products Co., Granite City, Ill.—Showed Cofar, a combined form and reinforcement for concrete slabs. It is deep-corrugated high-strength galvanized steel with transverse wires welded to it at each corrugation.

Hunt Process Co., Inc., Los Angeles, Calif.—Company manufactures striping machines, spray equipment for precise road marking, and membrane compounds. Prime exhibit feature was the Hunt concrete curing process.

Instant Moisture Control Division, Colorado Pre-Mix Concrete Co., Denver, Colo.—An instrument was shown which is used for instant determination and recording of moisture content in fine aggregate at batching or handling plants.

Master Builders Co., Cleveland, Ohio—Products for integral treatment of concrete, concrete floors, mortar, masonry surfaces, and grouting. Illustrations showed Masterplate, a metallic aggregate for concrete floor surfaces.

Maxon and Moore, Construction Equipment Dept. Milwaukee, Wis.—Presented architectural drawings of paving equipment and batching and mixing plants.

Prestressing, Inc., San Antonio, Texas—The "PI" method of prestressing was shown, and a cutaway beam section with jacks in position was presented. A demonstration of prestressing concrete was given at a site outside the exhibit area.

Pumice Inc., Idaho Falls, Idaho—Samples of "Volcolite" volcanic glass foam, used as aggregate for concrete and mortars as well as for insulation material, were displayed. Data from specifications for structural pumice concrete by the U. S. Atomic Energy Commission were presented.

John A. Roebling's Sons Corp., Trenton, N. J.—Photographs showed construction projects where Roebling tensioning materials were used in prestressed concrete. Information on high-strength steel wire strands, steel wire for cables, and anchor fittings was given.

Sika Chemical Corp., Passaic, N. J.—Plastiment and Sikacrete were featured. A photomural was shown of the Tappan Zee project where Plastiment was used. Igas, a joint-sealer, was demonstrated by a fishbowl formed with glass plates sealed with Igas.

Split-Rock Products Co., Milwaukee, Wis.—Display of Split-Rock masonry units in a wide variety of colors and sizes. Photographs showed finished structures.

Sonoco Products Co., Construction Products Division, Hartsville, S. C.—Sonotube fiber forms and Sonovoid were exhibited with an explanation of their use. Sonoairducts, lined with aluminum foil, for use in slab-floor perimeter heating systems were also displayed.

Superior Concrete Accessories, Inc., Chicago, Ill.—Main feature of the exhibit was Superior's "All-Ply" plywood panel forms for concrete. Other concrete forming accessories were displayed.

Symons Clamp and Manufacturing Co., Chicago, Ill. Models demonstrated the Symons panel forming system.

Techkote Co., Inc., Inglewood, Calif. (represented by Soiltest Inc., Chicago, Ill. — Featured was the Techkote air meter, a precision instrument for testing concrete both in the laboratory and the field. Soiltest apparatus for testing soils and concrete was displayed.

Water Seals, Inc., Chicago, Ill.—Company's line of water stops was shown, and a booklet describing the "Labyrinth Waterstop" was distributed.

Webrib Steel Corp., New York, N. Y.—Full sized, Hico adjustable horizontal form supports were demonstrated. Motion pictures showed their installation techniques.

Milwaukee convention committee

Robert A. Burmeister, chairman of the local committee, and his able assistants are to be congratulated for the large turnout and their excellent work on convention arrangements.

The Committee on General Arrangements, chairmaned by Mr. Burmeister, was composed of Arthur W. Devos, Robert H. Hopwood, Robert C. Johnson, W. D. Kimmel, O. Neil Olson, J. W. Poulter, Walter H. Tacke, J. W. Tanghe, George Tews, James G. Van Vleet, Kurt F. Wendt, and M. O. Withey.

The Exhibits Committee, under the chairmanship of Harold S. Hahn, included Fred Bartel, Gene Goeb, and Paul Mueller.

Glenway Maxon was chairman of the "First-Timers" Committee, with other members being A. W. Bigott, Wesley Bliffert, F. N. Menefee, and Willard Schuneck.

Ladies' committee

Mrs. R. A. Burmeister was chairman of the Ladies' Committee, with Mrs. W. D. Kimmel and Mrs. J. W. Tanghe as co-chairmen. Other members included Mrs. Edwin Bartlet, Mrs. Paul Bronson, Mrs. A. W. Devos, Mrs. Gene Goeb, Mrs. H. S. Hahn, Mrs. R. C. Johnson, Mrs. O. N. Olson, Mrs. Walter Patitz, Mrs. Thomas Pavek, Mrs. J. W. Poulter, Mrs. W. H. Tacke, Mrs. George Tews, Mrs. J. G. Van Vleet, Mrs. G. W. Washa, and Mrs. C. S. Whitney.

Robert A. Burmeister (left), chairman of the Milwaukee convention committee, discusses arrangements with one of the hard-working committee members W. D. Kimmel

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Positions and Projects — ACI Members

Area meeting held at Buffalo

An attendance of 135 Buffalo area members, guests, and students was reported at the first annual local area concrete meeting at the University of Buffalo on March 10. The meeting was sponsored jointly by ACI, the Portland Cement Assn., and the University of Buffalo. On the local committee were C. L. Lamoreaux, chief chemist, Federal Portland Cement Co., representing ACI, John B. McConville, PCA structural field engineer for western New York, and Paul E. Mohn, dean, School of Engineering, University of Buffalo.

The program featured a symposium on concrete problems by Roswell E. Pfohl, American Institute of Architects, James J. McDonald, American Society of Civil Engineers, Howard F. Stimm, Associated General Contractors of America, and Edward J. Numan, National Ready Mixed Concrete Assn. Mr. Pfohl suggested that the use of lower design strengths, which are more easily achieved, would simplify the architect's inspection of small concrete jobs. Mr. Stimm emphasized the need for realistic cooperation between designer, builder, and inspector, citing several instances of impossible specifications and unrealistic inspection requirements. Mr. McDonald emphasized the importance of complete design information to avoid foisting design problems upon the detailer. Mr. Numan pointed out that the growth of the ready-mixed concrete industry, at the expense of job-mixed concrete, depends upon reliable quality for its long-term prospects. The meeting was well received and it was agreed that it should be repeated annually.

Local concrete conference held at Columbus

An attendance of 100 members, guests, and students was reported at the March 15 meeting at Ohio State University, Columbus, by the local committee who were R. B. Hindman, engineer, Marietta Concrete Corp., representing ACI, H. G. Wood, Portland Cement Assn. district engineer for Ohio, and Prof. George E. Large of Ohio State University. The meeting, sponsored by ACI, PCA, and Ohio State University, consisted of an afternoon and an evening session. A talk on structural cast-in-place floors by R. C. Reese, structural engineer, Toledo, and a demonstration of a monolithic heavy-duty floor finish by E. B. Oberly, PCA regional construction consultant were featured at the meeting.

J. F. Barbee, materials engineer, Ohio State Highway Department, has agreed to act as local chairman for ACI for the 1956 meeting.

ACI participates in Chicago exposition

A display of ACI publications was one of the 105 exhibits at the Midwest Concrete Exposition at Chicago, February 24-26, sponsored by the Concrete Contractors Assn. of Greater Chicago. Featured at the technical sessions were papers on thin-shell roofs and tilt-up construction.

Butler wins NYU award

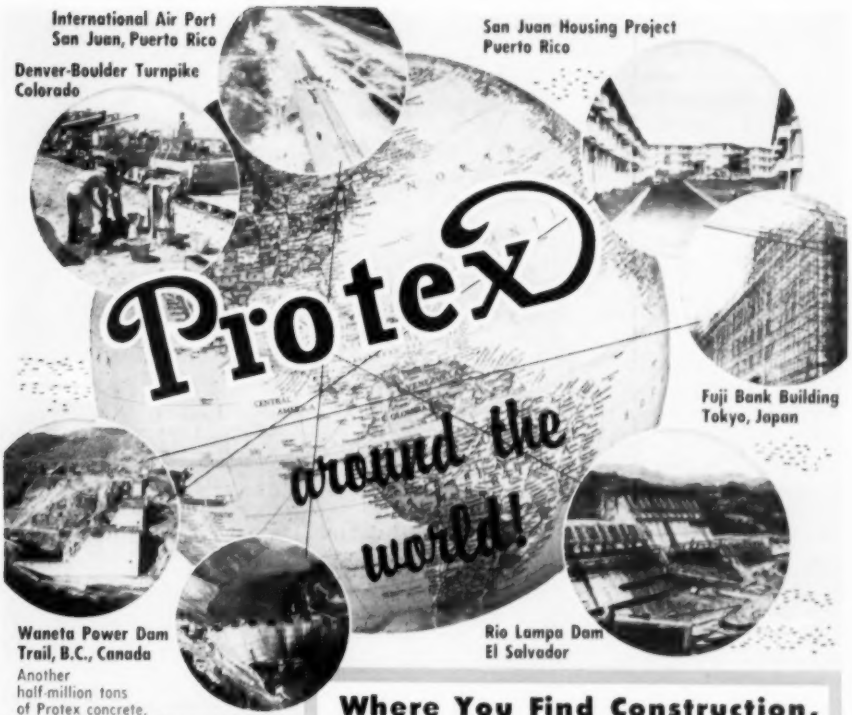
New York University, on the occasion of its 100th anniversary, has cited Morgan R. Butler, president Butler Bin Co., Waukesha, Wis., for his "professional achievements and services to the common good."

The citation is one of 100 similar honors awarded by the university since the founding of New York University College of Engineering in 1855.

A 1908 graduate of the university, with a degree in civil engineering, Mr. Butler is widely known for his engineering achievements in precision equipment for materials handling—especially in relation to concrete construction. He has been a member of ACI since 1922.

Detailing Manual basis of home study course

The "Manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315-51)" is the text forming the basis of an International Correspondence School Course on detailing reinforced concrete structures. The course, suited to high school graduates, explains general drafting room procedures and how to detail concrete structures. The student completes two sets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of examination questions and four drawing plates.

The course may be pursued by individuals or be administered by employers having a number of draftsmen to be trained. Employees may select one of four different plans under which the course can be given. Further details may be obtained from A. DeGroot, Director of Civil Engineering, International Correspondence Schools, Scranton, Pa.

Iowa State holds Sixth Better Concrete Conference

The Sixth Annual Better Concrete Conference on March 17 and 18, presented by Iowa State College in cooperation with ACI, Portland Cement Assn., Iowa Highway Commission, Iowa Ready-Mixed Concrete Assn., Iowa Engineering Society, American Institute of Architects (Iowa), American Society of Civil Engineers (Iowa), Master Builders of Iowa, and Associated General Contractors (Iowa), was attended by approximately 125 persons. The meeting, directed by Prof. H. J. Gilkey, head, Department of Theoretical and Applied Mechanics, featured one session on problems in the use of ready-mixed concrete. The second day included talks by R. E. Copeland, director of engineering, National Concrete Masonry Assn., on the use of quality concrete masonry, and H. S. Meissner, research engineer, U. S. Bureau of Reclamation, on admixtures.

Garner and Lucas new PCA district engineers

Harold G. Garner has been appointed district engineer of the Kansas City, Mo., office and Kenneth B. Lucas has been appointed district engineer of the Omaha office of the Portland Cement Assn. Mr. Garner succeeds Edward J. Mueller, who is retiring from the association. Mr. Lucas succeeds Mr. Garner.

Missouri sponsors structural engineering conference

The Civil Engineering Department of the University of Missouri will sponsor a Structural Engineering Conference May 20-21, 1955. Prof. Charles H. Scholer, head, Applied Mechanics Department, Kansas State College, Manhattan, and past president of ACI, will be one of the principal speakers.

LOOKING AHEAD

May 5-6, 1955—Annual Meeting, Society of American Military Engineers, Hotel Waldorf-Astoria, New York, N. Y.

May 20-21, 1955—Structural Engineering Conference, University of Missouri, Columbus, Mo.

June 2-4, 1955—Annual Meeting, National Society of Professional Engineers, Hotel Bellevue-Stratford, Philadelphia, Pa.

June 13-18, 1955—St. Louis Convention, American Society of Civil Engineers, Jefferson Hotel, St. Louis, Mo.

June 20-24, 1955 — Annual Meeting, American Institute of Architects, Hotel Radisson, Minneapolis, Minn.

June 20-24, 1955—63rd Annual Meeting, American Society for Engineering Education, Pennsylvania State University, State College, Pa.

June 26—July 1, 1955—Annual Meeting, American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, N. J.

October 31—November 1, 1955—Atlanta Regional Meeting American Concrete Institute, Atlanta Biltmore Hotel, Atlanta, Ga.

Pumice Institute formed

Organization of the Pumice Institute was announced recently. The new group will unify efforts of pumice producers to make available technical data and information to architects, structural engineers, and builders on the use of pumice in construction.

Lloyd Williamson, Bend, Ore., was elected president. Other officers and directors are Robert H. McClure, New York, vice-president; R. W. Alley, Jr., Santa Fe, and William E. Miller, Bend, Ore.

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restores concrete piers of MacArthur Bridge, Burlington, Iowa

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NATIONWIDE SERVICE

Form Nordic Concrete Assn.

The Nordic Concrete Assn. was formed recently to promote the technical development of concrete in Scandinavian countries. The objective of the group is to promote cooperation between concrete experts of the Nordic countries. To this end the first activity will be to form Nordic concrete congresses. Committee work will be directed toward cooperation in concrete research.

The new organization hopes to set up procedures, regulations, and standards for concrete work and concrete production in the countries of member organizations. The group is a union of five Nordic Organizations: Dansk Ingeniorforenings Betonsektion (Denmark), Suomen Betoniyhdistys (Finland), Verkfraedingafelag Islands, Norsk Betongforening (Norway), Svenska Betongföreningen (Sweden).

Aulis Junttila is chairman and Pentti Vähäkallio is secretary of the new organization which has its headquarters in Helsinki, Finland.

NSPE annual meeting

The National Society of Professional Engineers will hold its annual meeting June 2-4, 1955, in the Bellevue-Stratford Hotel, Philadelphia.

A highlight of the three-day meeting will be the presentation of the society's annual award for outstanding service to Dr. Andrey A. Potter, dean emeritus, Purdue University.

Vacuum concrete convention in Paris

The Third International Vacuum Concrete Congress will be held at the George V Hotel, Paris, France, June 6-11, 1955. The congress will be under the supervision of the Centre Scientifique International Billner. Mr. K. P. Billner, president, Vacuum Concrete, Inc., Philadelphia, will preside as president with Prof. Gustave Magnel and Dr. T. Delfini as vice-presidents. Topics to be covered in the program are: forming of cast-in-place concrete, making of precast slabs, pipes and irrigation flumes, problems of granulometry, and association of vacuum concrete to prestressing.

Who's Who This Month

Charles H. Scholer

Retiring ACI President Charles H. Scholer's address at the general luncheon of the 51st Annual Convention in Milwaukee appears on p. 733.

Professor Scholer, head, Department of Applied Mechanics, Kansas State College, Manhattan, is so well known to ACI members that he needs no introduction.

B. F. Jakobsen

"Theory of the Secondary Arch," p. 741, is written by B. F. Jakobsen, consulting engineer, Menlo Park, Calif.

Mr. Jakobsen has been connected with Roosevelt Dam, Ariz.; Elephant Butte Dam, near El Paso, Texas; Kerckhoff Dam, San Joaquin Light and Power Corp., Fresno, Calif.; Pacoima Dam and Big Santa Anita Dam, Los Angeles County Flood Control District; Folsom Dam, near Sacramento, and Pine Flat Dam near Fresno, and a number of smaller dams with the U. S. Army Corps of Engineers. He was also a reviewing engineer on Hamilton Dam, Texas, and Victoria Dam on the Ontonagon River, Mich.

Mr. Jakobsen has written many technical papers and discussions. He was awarded the ASCE Norman Medal for two of his papers, in 1924 and again in 1927. He is a registered civil and structural engineer in California and has been an ACI member since 1950.

R. A. Larsen and Vagn Ussing

"Prefabricated Factory Construction in Denmark," p. 757, is presented jointly by R. A. Larsen and Vagn Ussing.

Mr. Larsen is president of the Danish contracting and engineering firm, Larsen & Nielsen Constructor A/S, which has its headquarters in Copenhagen. In 1928 he graduated from the Technical University of Denmark with an MS in civil engineering. After several years with large Danish engineering firms at home and abroad, Mr. Larsen joined A. Nielsen. Their firm has been pioneering several new techniques in reinforced concrete such as shell structures, prefabrication, and prestressed concrete. The company is doing engineering and construction work in several European countries.

Mr. Larsen is vice-president in the Danish Contractors Assn. and a member of the board for the Civil Engineering Section of the Danish Institute of Civil Engineers. He has been a member of ACI since 1948.

Mr. Ussing is an assistant director in Larsen & Nielsen Constructor A/S and was manager for the company on the project described in this paper. He graduated in 1943 from the Technical University of Denmark with an MS in civil engineering. After three years with a consulting engineer, Mr. Ussing attended graduate courses at the University of Washington, Seattle, for a year and worked for one year in the office of Isodor Thompson, San Francisco, taking part in the structural design of several interesting structures such as Mt. Zion Hospital, San Francisco, and the Jewish Center, Cleveland. Mr. Ussing has been employed by Larsen & Nielsen Constructor A/S since he returned to Denmark. In 1953 he was promoted to his present position.

A. E. Cummings

"Strength Variations in Ready-Mixed Concrete," p. 765, is presented by A. E. Cummings, director of research, Raymond Concrete Pile Co., New York.

Mr. Cummings received a BS in civil engineering from the University of Wisconsin in 1915, and a civil engineering degree in 1922. He has been employed by Raymond Concrete Pile Co. since 1916 in various capacities including district manager of its Chicago office for 23 years. He is the author of numerous papers and discussions on subjects related to soil mechanics and fundamental engineering.

His society memberships are many. Besides ACI he belongs to ASCE, ASTM, Boston Society of Civil Engineers, Society for Experimental Stress Analysis, Highway Research Board, and Sigma Xi. He has been an ACI member since 1924 and is chairman of ACI-ASCE Committee 323, Prestressed

Reinforced Concrete; a member of ACI Committees 318, Standard Building Code; and 324, Precast Reinforced Concrete Structures. He is also ACI representative on ASA Sectional Committee A-56, Building Code Requirements for Excavations and Foundations.

Henry J. Cowan

Henry J. Cowan, professor of architectural science, University of Sydney, Sydney, Australia, authored "Balanced Design of Prestressed Concrete Beams," p. 773.

Prior to his present position, Dr. Cowan was a lecturer in civil engineering in charge of the concrete laboratory, University of Sheffield, England, as well as special lecturer in architecture. A graduate of Manchester University, Mr. Cowan received his MS there in 1940.

Following World War II, he was assistant engineer with Higgs and Hill, civil engineering contractors of London, and later senior designer in structural and mechanical development with a subsidiary of Associated Light Metal Industries. Prior to joining the University of Sheffield staff he was assistant lecturer at the University of Wales, Cardiff. He is the author of papers on concrete and reinforced concrete design in several British publications.

T. C. Powers and H. H. Steinour

"An Interpretation of Some Published Researches on the Alkali-Aggregate Reaction. Part 2—A Hypothesis Concerning Safe and Unsafe Reactions with Reactive Silica in Concrete," p. 785, is by T. C. Powers and H. H. Steinour, manager, Basic Research, and manager, Literature Section, respectively, Portland Cement Assn., Chicago.

For biographical information on these two gentlemen, see p. 24 of the February 1955 ACI *News Letter*.

Prestress course at Brooklyn

Polytechnic Institute of Brooklyn has just concluded its first graduate course on prestressed concrete. The course was highlighted by eight lectures by outside authorities. It will be offered every fall. The course was under the direction of Prof. Odd Albert.

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New Members

The Board of Direction approved 79 Individual applications, 1 Corporation, 18 Juniors, and 8 Students making a total of 106 new members. Considering losses due to resignations, deaths, and nonpayment of dues the total membership on March 1 was 6801.

Individual

ACHIM, VICTOR, Abilene, Texas (Gen. Labor Foreman, R. E. McKee, Gen. Contr., Inc.)

ALLEN, ROBERT P., Hartford, Wis. (City Engr., Civil Engrg., City of Hartford)

ASH, W. F., Reno, Nev. (Pres., Berylex National Sales Co.)

BALMER, GLENN, Chicago, Ill. (Development Engr., PCA)

BASILE, HOWARD, Durham, N. C. (Vice-Pres. & Gen. Mgr., Quality Control Products, Inc.)

BECKER, MELVIN E., Buffalo, N. Y. (Sales Engr., Pine Hill Concrete Mix Corp.)

BLANTON, WILLIAM J., Richmond, Va. (Struct. Engr., Concrete Building Units Co.)

BOS, JOHN N., Chicago, Ill. (Asst. Secretary, John N. Bos Sand Co.)

BREHLER, JOSEPH C., Ann Arbor, Mich. (Asst. Laboratory Supv., Michigan State Highway Dept.)

BROKAW, ARTHUR T., East Orange, N. J. (City Engr., City of East Orange)

BROWN, C. F., Jr., Hickman Mills, Mo. (Sales Representative, The Master Builders Co., Cleveland, Ohio)

BURMEISTER, LLOYD G., Milwaukee, Wis. (Owner, L. Burmeister Co.)

CAMELLERIE, J. F., New York, N. Y. (Chf. Engr., Plummer Associates, Inc.)

CAMIRAND, LEO PAUL, Montreal, Canada (Promoting, Selling & Servicing concrete specialties, Alex Bremner, Ltd.)

CHIVERTON, THOMAS J., Ontario, Calif. (Supt., Concrete Pipe Dept., Basalt Rock Co., Fontana, Calif.)

CHORNIK, SALOMON, Santiago, Chile (Prof. of Struct., Engrg., Universidad de Chile)

CLAY, RICHARD H., Bridgeport, Wash. (Asst. Office Engr., U. S. Army Engrs., Chief Joseph Dam)

DARLING, DOUGLAS G., Toronto, Canada (Chf. Engr., Toronto Brick Co., Ltd.)

DAVID, EVAN S., Ashton Park, England (Asst. in Design, detailing & site supervision of R/C structures, Clarke, Nichols & Marcel)

DIAZ, HENRIQUE RODRIGUEZ, Caracas, Venezuela (Civil Engr., C. A. Vialarte)

ENGLUND, EVERETT H., St. Paul, Minn. (Gen. Mgr., F. J. Morse & Co., Inc.)

FEHR, EMIL, Eau Claire, Wis. (Owner, Fehr Concrete Products Co.)

FREI, OTTO C., Atlanta, Ga. (Pres., Georgia Lightweight Aggregate Co.)

GONGWER, JAMES M., Washington, D. C. (Cons. Struct. Engr.)

HALL, JOHN P., Austin, Texas (Pres., United States Lift Slab Corp.)

HANSEN, DONALD A., Davenport, Iowa (Salesman, The Master Builders Co., Cleveland, Ohio)

HENGGELER, CHARLES, Kansas City, Mo. (Struct. Designer, Cooper, Robison & Carlson)

HUDBELL, FRED A., Jr., Atlanta, Ga. (Exec. Vice-Pres., Southeastern Lift Slab, Inc.)

HUNTER, OLIVER S., Durham, Canada (Student, c/o A. S. Hunter & Co.)

JACKSON, R. W., Tulsa, Okla. (Struct. Engr., Black & West, Architects)

JEKEL, J. A., Johannesburg, S. Africa (Draftsman, Unger & Van DerBijl)

JESSUP, WALTER E., New York, N. Y. (Editor, Civil Engineering, ASCE)

JOHNSON, GLENN E., New Orleans, La. (Struct. Engr., U. S. Navy, Design Div., District Public Works)

JOHNSON, L. J., Indianapolis, Ind. (Distr. Mgr., The Master Builders Co., Cleveland, Ohio)

JONES, CLINTON EDWIN, Atlanta, Ga. (Field Engr., PCA)

KAAR, PAUL H., Wilmette, Ill. (Development Engr., PCA)

KELLEY, ALEX C., Atlanta, Ga. (Mgr., Fabricating Div., Atlantic Steel Co.)

KESE, HERBERT E., Appleton, Wis. (Civil Engr., Thilmany Pulp & Paper Co., Kaukauna, Wis.)

KOEPKE, LAWRENCE H., Appleton, Wis. (Pres., Concrete Pipe Corp.)

KRAUS, GOMER E., Jacksonville, Fla. (Consulting, Structural Engineer)

LEHMAN, FREDERICK G., Newark, N. J., (Asst. Prof. in Civil Engrg., Newark College of Engrg.)

LEONTOVICH, VALERIAN, Palo Alto, Calif. (Prof. Engr.)

LLORENS, MANUEL B., Mexico City, Mexico (Civil Engr.)

LOBEIRA, JUAN C., Monterrey, Mexico (Civil Engr.)

LUDIG, HARALD W., Kansas City, Mo. (Design Engr., Howard, Needles, Tammen & Bergendoff)

MACKAY, JOHN G. L., Sunbury-on-Thames, England (Director of Research, Civil Engrg. Laboratories, The Square Grip Reinforcement Co., (London) Ltd.)

MAKISHITA, OTOSHIRO, Sapporo, Japan (Chf. of Civil Engrg. Dept. Nippon-Doro Co., Ltd.)

MARSHALL, JOHN F., Toronto, Canada (Asst. to the Vice-Pres., Engrg., Canadian Breweries, Ltd.)

MOINULLAH, AHMED, Madison, Wis. (Grad. Student, Univ. of Wis.)

MONCH, OTTO H. S., Caracas, Venezuela (Civil Engr., Inspector & Design, Servicio de Ingenierai Militar —Minosterio de la Defensa)

MOORE, HERBERT, Milwaukee, Wis. (Civil Engrg., Hydraulic & Sanitary Engrg., Maxon & Moore, Cons. Engrs.)

NAGAO, HIKARU, Chicago, Ill. (Assoc. Matls. Engr., Armour Research Foundation of Ill. Inst. of Tech.)

NILES, RENO A., Chicago, Ill. (Mgr., Constr. & Engrg. Dept., of the Sales Dept., Standard Oil Co.)

NISBET, ROBERT B., Nutley, N. J. (Associated Matls. Engr., Miller-Warden Associates)

O'NEIL, C. W., Chicago, Ill. (Vice-Pres. in charge of Merchandising & Eastern Sales, Berylex National Sales Co., Reno, Nev.)

PARTHENIADES, EMMANUEL, Berkeley, Calif. (Student, Univ. of Calif.)

PINNER, ROBERT H., Wash., D. C. (Grain Storage Engr., The Ralph M. Parson Co., Los Angeles Calif.)

PINTO, JOSEPH, Astoria, New York (Designer & Senior Draftsman, Jefferson Chemical Co.)

RACINE, KARL, Los Angeles, Calif. (Design Engr., P.O.L. Systems & Chemical Plants, Adren-Wilson & Assoc.)

REEDER, WILLARD C., Detroit, Mich. (Constr. Engrg., Long Construction Co., Kansas City, Mo.)

REICHENBACH, J. H., Dewey, Okla. (Chief Chemist, Dewey Portland Cement Co.)

RILEY, NEIL W., Atlanta, Ga. (Pres., Hall Steel Co.)

ROCHA, ELPIDIO, JR., Kansas City, Mo. (Civil Engr., Arch. & Engrg., design, structural, City Gov't., Park Dept.)

SALVADOR, JUANITO, F., Caloocan, Philippines (Struct. Engr., Public Works Center, U. S. Naval Base, Guam, M. I.)

SCRUGGS, BURRIL, M., Sharp Park, Calif. (Civil Engr., D.P.W.O.)

SHAVER, PAUL D., New York, N. Y. (Chief Engrg., U. S. Air Force)

SPENCER, GEORGE C., Dallas, Texas (Design & Drafting Engr., William L. Cobb, Cons. Engr.)

STANNERS, JAMES E., Toronto, Canada (Chf. Struct. Engr., Shore & Moffat, Archs.)

STOCKARD, H. J., JR., Raleigh, N. C. (Exec. Secretary N. C. Ready Mixed Concrete Assn.)

STOKES, DAVID W., Denver, Colo. (Checker, Design & Detail Engineers, Inc., Associated)

STONE, ARTHUR H., Chicago, Ill. (Chief Utilities Engr., Joseph K. Knoerle & Associates, Inc., Cons. Engrs.)

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THOMSON, EDWARD, Chicago, Ill. (Struct. Engr., Pioneer Service & Engr. Co.)
WAITE, J. H., Waukesha, Wis. (Pres. & Gen. Mgr., Waukesha Cement Tile Co.)
WHITE, JOE D., Laurell, Miss. (Engr., Designs & Supervises installation of machines & structures, Masonite Corp.)
YAKOVLJEVITCH, NICK, Detroit, Mich. (Sr. Struct. Engr., Smith, Hinchman & Grylls, Inc.)
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CARGILL, RALPH, St. Joseph, Mo. (Asst. Mgr., Feeney Construction Co.)
DONATO, LOUIS F., Brooklyn, N. Y. (Civil Engr., Allied Processes, New York, N. Y.)
ETTEDGUI-LANDAETA, MARCOS, Caracas, Venezuela (Designing Engr., Instituto Nacional de obras Sanitarias)
FARANTATOS, G. N., Toronto, Canada (Engr. in charge of Foundation Section, Dept. of Highways of Ont.)
GENEREUX, ROBERT J., Regina, Canada (Civil Engr., Dept. of Highways)
GONZALEZ, CARLOS EDUARDO R., Bogota, Colombia (Civil Engr., Spinel & Cia Ltda.)
LAVERY, R. G., Toronto, Canada (Concrete Engr., Associated Quarries & Construction, Ltd.)
MERA, FRANCISCO JOSE, Ithaca, N. Y. (Civil Engr.)
MURCIA, LUIS ERNESTO G., Bogota, Colombia (Civil Engr., Spinel & Cia. Ltd.)
PABON, JESUS ANTONIO C., Bogota, Colombia (Civil Engr., Joaquin Spinel)
PANDIT, G. S., Sangar, India (Asst. Engr., University of Sangar)
PYFROM, EUGENE ARNAUD, Nassau, Bahamas, B.W.I. (Laboratory testing, Washington Brick Co., Washington, D. C.)
QUINONES, PEDRO JIMENEZ, Mayaguez, P. R. (Instructor, Civil Engrg. Dept., College of Agriculture & Mechanics Arts, U. of P. R.)
RATNER, PAUL, Brooklyn, N. Y. (Struct. Designer, Ammann & Whitney, New York, N. Y.)
SEINUK, YSRAEL A., Havana, Cuba (Civil Engr., Asst. Struct. Designer, Saenz-Cancio-Martin, Ingenieros)
WALLACE, SCOTT, Urbana, Ill. (Instructor, Univ. of Illinois)

Student

BRANSON, DAN E., Columbus, Ga. (A. P. I.)
BROMS, BENGT, Urbana, Ill. (Univ. of Ill.)
DIORIO, TOM, Baldwin, L. I., N. Y. (Univ. of Conn.)
GRIMALDI, JOSEPH A., Brighton, Mass. (Northeastern Univ.)
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YACOUBIAN, LEON A., Damascus, Syria, (MIT)
ZOGRAFOS, NICK, Chicago, Ill.

Have YOU sponsored a member lately?

Honor Roll

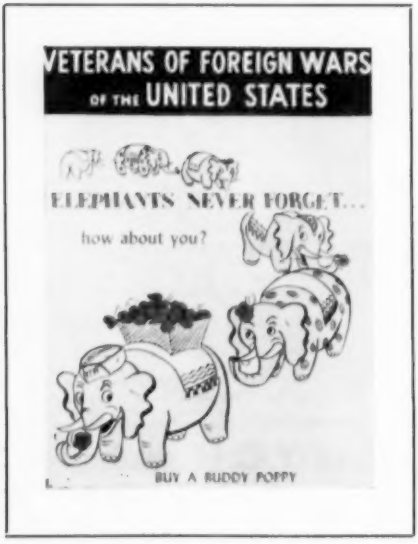
February 1—February 28, 1955

This is the first tabulation of the Honor Roll for the current year. W. H. Armstrong, Atlanta, Ga., is commended for his splendid interest in expanding ACI to others who will benefit through membership.

W. H. Armstrong	7
Jose L. Capacete	2
M. A. Craven	2
Samuel Hobbs	2
J. W. Kelly	2
Phillip L. Melville	2
Mete Sozen	2

Benjamin J. Baskin

Benjamin J. Baskin, chief engineer, Concrete Products Co. of America, Philadelphia, died on February 15. He graduated from Pennsylvania State College in 1914 and was associated with Henry W. Horst Co. as chief engineer in the construction of Philadelphia's Eighth Street subway. In 1940 he became chief engineer of Concrete Products Co. of America and pioneered in the development of pre-tensioned prestressed concrete bridges. He had been an ACI member since 1947.



James N. Davis administrative assistant at PCA

James N. Davis has been made administrative assistant of the Portland Cement Assn. Mr. Davis has been construction analyst in the association's general offices in Chicago since 1948. In his new position, he will work directly with the president and administrative officers of the association and will continue responsibility for construction analysis.

McDowell acquires machinery firm

McDowell Co., Inc., Cleveland, recently acquired all of the assets, including the Dwight-Lloyd research facilities, of Sintering Machinery Corp., Netcong, N. J. The Dwight-Lloyd laboratory is to be expanded and moved to Cleveland. Manufacture of the Dwight-Lloyd equipment is scheduled for the shops of McDowell's Wellman Engineering Co. Division, Cleveland.

Inspectors school held

The ninth annual school for building officials and inspectors was conducted at the University of Illinois, Urbana, on March 21-25. The school, held in cooperation with the Midwest Conference of Building Officials, featured current practices in heating and air conditioning, building and zoning, fire safety, roof truss construction for residences, and other topics of interest to inspectors and building officials.

ACPA holds convention

The American Concrete Pipe Assn. held its 47th annual convention in Boston, March 8-13. Featured topics of the convention were experiences in the use of concrete pipe, concrete pipe—a consultant's viewpoint, and concrete technology as applied to manufacture of various types of concrete pipe.

Among the speakers were F. M. Cahaly, Miles N. Clair, Francis A. Obert, and Herman Protze.

A. W. G. Clark, president, B. C. Concrete Co., Ltd., Vancouver, Canada, was re-elected president of the association. E. F. Bespalow, vice-president, Choctaw, Inc., Memphis, was elected vice-president. Hugh P. Ford, Eugene Concrete Pipe & Products Co., Eugene, Ore., and Harry W. Heath, vice-president, Lock Joint Pipe Co., East Orange, N. J., were re-elected vice-presidents.

Bound volumes needed

An ACI member wishes to purchase bound copies of ACI *Proceedings* Vol. 40 and 41. These volumes are no longer available from ACI headquarters. Anyone who no longer needs these volumes and wishes to sell them should write to ACI headquarters. The Institute will purchase a limited number of them for $2.50 per copy. Do not send the volumes, however, until notified to do so.

Tools, Materials, Services

Under this heading note will be made from time to time of producer literature of presumed technical interest (and available from its source for the asking) to ACI users of tools, equipment, materials, accessories, and special services.

Mobile batch plant

A completely self-contained mobile batch plant has been developed by Fruehauf Trailer Co. in connection with Noble Co. The unit is self-sufficient. It has facilities for storage, its own generator for power, and can be supplied from a water tank if necessary.—Fruehauf Trailer Co., Oakland, Calif.

Bonding agent

A technical bulletin issued by Dewey and Almy Chemical Co. describes the use of Daraweld, bonding agent for concrete and mortar. The bulletin describes preparation, patching, finishing, and curing of pastes treated with the latex-emulsion bonding agent.—Dewey and Almy Chemical Co., Division of W. R. Grace & Co., Cambridge 40, Mass.

Insulated concrete wall

Vermiculite Institute has issued a technical "kit" which provides information on a machine-applied vermiculite concrete insulated wall for use in combination with any type of exterior facing and interior finish. The 68-page kit, "Data on Vermiculite Concrete Panel or Spandrel Walls," contains basic design data and working drawings by Severud-Elstad-Krueger, consulting engineers, with their design analysis and recommended connection details for steel frame or reinforced concrete buildings. Also included are fire test reports and an analysis by Nolan D. Mitchell, listing wall thicknesses for various degrees of fire resistance.—Vermiculite Institute, 208 South LaSalle St., Chicago 4, Ill.

Saw blade

A diamond saw blade for cutting concrete, brick, tile, refractory, and other masonry material is being offered by Cardinal Engineering Corp. The blade is available in 14- and 16-in. sizes for wet cutting on standard masonry saws. In addition, special blades are available to meet a variety of requirements. Bulletin P-10 gives necessary information.—Cardinal Engineering Corp., Philadelphia 27, Pa.

Equipment magazine

Interesting case histories of Pettibone Mulliken materials handling and aggregate processing equipment are presented in a new monthly magazine, "Modern Methods," published by Pettibone Mulliken Corp.—Pettibone Mulliken Corp., 4700 West Division St., Chicago 51, Ill.

Concrete saw

A concrete saw, Model E-25-PD, has been announced by Eveready BrikSaw Co. It is equipped with a 25-hp, 4-cylinder, air-cooled gasoline engine. The saw can attain speeds up to 12 ft per min. The saw is available with or without "Powr-Drive," a self propelling unit; an electric self starter; and a water pump.—Eveready BrikSaw Co., 1509 South Michigan Blvd., Dept. 256, Chicago 5, Ill.

Corrosion protection

Pennsalt has announced a new resin coating for protection of surfaces exposed to humid and corrosive atmospheres. The coating can be applied with brush, roller, or spray as it comes from the can. Several regular colors are offered with others available by special order.—Pennsylvania Salt Manufacturing Co., 1000 Widener Bldg., Philadelphia 7, Pa.

Mortar mixer

Chain Belt Co. has put into production a 4-cu ft plaster and mortar mixer. The tilting-drum mixer has a 36¼-in. charging height and a 9½-in. discharge height. A bag cutter is located over the mixing drum. The mixer is powered by a 1-cylinder air cooled, 3.2-hp, Kohler engine.—Chain Belt Co., Milwaukee 1, Wis.

"Electrified" joist floors

A 16-page booklet, "Electrical Outlets Wherever You Need Them," has been published by Concrete Reinforcing Steel Institute. It gives details on reinforced concrete duct floors, a development which provides greater electrical flexibility for buildings at low cost. The "R/C Duct Floors" are standard concrete joist floors with a network of electrical distribution ducts buried in the structural slab. Booklet explains structural details, design considerations, and cost comparisons. A study of five rating tests is included.—Concrete Reinforcing Steel Institute, 38 South Dearborn St., Chicago 3, Ill.

Masonry paint

A. C. Horn Division, Sun Chemical Corp., is marketing a cement-base paint designed to prevent water seepage. "Waterfoil" is said to be effective for use in basements, elevator pits, grain silos, for furnaces, electrical equipment, and warehouses.—Sun Chemical Corp., A. C. Horn Division, Long Island City, N. Y.

Floor surfacing

The Master Builders Co. has issued a 12-page bulletin on DPS Masterplate floor surfacing. A complete description is given of this ready-to-use material which is applied as a dust-coat to freshly floated concrete.—The Master Builders Co., 7016 Euclid Ave., Cleveland, Ohio

Concrete cutter

A concrete cutter that weighs 482 lb and is so balanced that it can be tilted back on the rear wheels or lifted on the front wheels has been developed by Felker Manufacturing Co. The Model 200 concrete cutter is designed for 10- and 12-in. blades but is powered to accommodate larger wheels with special guards. With nominal wheels, cutting depth is 2¾ or 3¾ in. The spindle is double end for right or left hand cutting. Coolant is supplied to the blade from the front, right and left sides. The cutter is available with or without power drive to the rear wheels and utilizes a 13.5-hp Wisconsin gas engine.—Felker Manufacturing Co., 1128 Border Ave., Torrence, Calif.

Autoclave systems

A 4-page brochure "Bros Single Responsibility Autoclave System for High Pressure Curing" has been published by Wm. Bros Boiler and Manufacturing Co. The brochure includes information on autoclave vessels, packaged boilers, racks, fans, ducts, valves, and fittings.—Wm. Bros Boiler and Manufacturing Co., General Sales Division, 1057 Tenth Ave. S.E., Minneapolis 14, Minn.

Portable shotcreting rig

A new portable rig for air placement of concrete has been announced by Air Placement Equipment Co. The rig consists of the Airplaco Bondactor for shotcreting and the Airplaco Mix Elvator, a combination proportioning, mixing, and elevating machine. The two pieces of equipment are used in combination to form the Bondactor-Mix Elvator portable rig.

The Mix Elvator (left of figure) mixes the dry materials and prepares them for shotcreting. The dry materials are placed in the mixer through a proportioning chute in the side of the machine. There they are thoroughly and uniformly mixed by an auger-type mixer in the base. A bucket-type conveyor picks up the mix, elevates it, and deposits it in a reservoir directly above the shotcreting equipment. As the aggregate is needed, it is released into the upper hopper of the shotcreter. A hinge assembly on the elevator housing of the mixer-elevator makes it possible to lay back the elevating part of the machine while it is being transported from one job to another with a minimum road clearance.

The Bondactor (right of figure, mounted on the chassis of the mixer-elevator) guns or shoots concrete with compressed air. Pre-mixed materials placed in the upper hopper are metered continuously under pressure through the lower hopper into the material hose. They are propelled to the nozzle which is equipped with separate air and water lines. At the nozzle, the mix is thoroughly hydrated by an atomized spray.

Airplaco shotcreting equipment is available in various sizes including Model 750—capacity of ¾ cu yd per hr using 105 cfm compressor, Model 1250S—1½ cu yd per hr using 105 or 125 cfm compressor, Model 1250L—3 cu yd per hr capacity using 210 or 250 cfm compressor. Also available for mounting on the rig is the Airplaco Nucretor with 4½-or 6-cu yd per hr capacity. The equipment comprising the portable rig is available separately, mounted on its own chassis and set of wheels. When used in combination with the mixer-elevator, the shotcreting equipment is mounted on the chassis.—Air Placement Equipment Co., 1011 West 24th Street, Kansas City, Mo.

Manual of tables

Isteg-Stahl-Ges. m.b.h. has published the "Torsteel Manual of Tables" for use with Torsteel reinforcing bars. Text is in German.—Isteg Stahl-Ges. m.b.h., Neumakt, Haus Lempertz, Cologne, Germany.

Membership in the American Concrete Institute

To facilitate prospective members in joining the Institute, membership application forms are provided. Present Members may aid by bringing these forms to the attention of those who may profit from membership advantages. The grades of membership are described overleaf.

All who have an interest in concrete and a desire to improve it through a nonprofit educational service in gathering, correlating, and disseminating information on design, construction, manufacture, use, and maintenance of concrete structures and products are eligible for Institute membership.

There are many opportunities in the Institute for technical committee activity, contributions from your experience in technical papers and the briefer "Letters from Readers" section, and in reviewing technical literature. Thus you can help further ACI's aim "to provide a comradeship in finding the best ways to do concrete work of all kinds and in spreading that knowledge," and at the same time benefit from the experiences of other Members.

(cut here)

Board of Direction, American Concrete Institute
18263 W. McNichols Road
Detroit 19, Michigan

Date _____

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Of the annual dues, $12.00 is for the JOURNAL of the American Concrete Institute (except that dues for Junior and Student Members apply in full for the JOURNAL).

The undersigned hereby applies for _____ **membership**
(Individual, Corporation, Contributing, Junior, Student)

in the American Concrete Institute. Proposed by _____

For Corporation Membership, ACI representative will be _____

_____ (Date of graduation if Student)

_____ (Name, if Corporation)

Signature _____

For our records, please complete both sides of application.

EXCERPTS FROM BYLAWS: ARTICLE I—MEMBERS

Section 1. This Institute shall consist of Members, Corporation Members, Contributing Members, Junior Members, Student Members and Honorary Members interested in furthering the Institute's objects as set forth in its Charter.

Sec. 2. A Member shall be an individual.

A Corporation Member shall be a firm, corporation, society, agency of government or other organization. A Corporation Member shall name one individual as its representative who will enjoy all membership rights and privileges.

A Contributing Member shall be an individual, firm, corporation, society, agency of government or other organization wishing to give larger support to Institute activities through the payment of larger dues. Contributing Members, other than individuals, shall name representatives as do Corporation Members.

A Junior Member shall be a person less than 28 years old.

A Student Member shall be less than 28 years old and a student in residence at a recognized technical or engineering school.

An Honorary Member shall be a person of eminence in the field of the Institute's interest, or one who has performed extraordinarily meritorious service to the Institute.

Sec. 3. All classes of Members except Honorary Members and Student Members, shall be proposed by at least one Member of the Institute and elected by a two-thirds vote of the Board of Direction. An Honorary Member shall be elected by unanimous vote of the Board of Direction. A Student Member shall be proposed by a member of his school's faculty, who need not be a Member of the Institute, and elected by a two-thirds vote of the Board of Direction.

Sec. 4. All Members shall have all rights and privileges of membership as determined by the Board of Direction except that a Junior or Student Member shall not vote nor hold office. The status of a Student Member shall change automatically to that of Junior Member on the first anniversay of his membership succeeding the date on which he ceases to be a student in residence. The status of a Junior Member shall be changed to that of Member on the first anniversary of his membership after he becomes 28 years of age.

Sec. 5. Applications for and resignations from Membership and requests for change of representatives of Corporation or Contributing Memberships shall be presented in writing to the Secretary-Treasurer. Resignations may be accepted only from Members whose dues are not more than 60 days in arrears, except by special action of the Board of Direction.

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Current ACI Standards

Manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315-51)
A publication of large format, bound to lie flat
55 pages: $3.00 per copy ($1.75 to ACI Members)

Manual of Standard Practice for Detailing Reinforced Concrete Highway Structures (ACI 315A-53)
A publication of large format, bound to lie flat
41 pages: $2.75 per copy ($1.50 to ACI Members)

Building Code Requirements for Reinforced Concrete (ACI 318-51)
64 pages in covers: 75 cents per copy (40 cents to ACI Members)

Recommended Practice for the Use of Metal Supports for Reinforcement (ACI 319-42)
4 pages: 35 cents per copy

Standard Specification for the Design and Construction of Reinforced Concrete Chimneys (ACI 505-54)
48 pages in covers: $1.00 per copy (50 cents to ACI Members)

Recommended Practice for Winter Concreting Methods (ACI 604-48)
20 pages in covers: 50 cents per copy (40 cents to ACI Members)

Recommended Practice for Selecting Proportions for Concrete (ACI 613-54)
16 pages in covers: 50 cents per copy (40 cents to ACI Members)

Recommended Practice for Measuring, Mixing and Placing Concrete (ACI 614-42)
30 pages in covers: 50 cents per copy (40 cents to ACI Members)

Recommended Practice for the Application of Portland Cement Paint to Concrete Surfaces (ACI 616-49)
16 pages in covers: 50 cents per copy (40 cents to ACI Members)

Specifications for Concrete Pavements and Bases (ACI 617-51)
24 pages in covers: 50 cents per copy (40 cents to ACI Members)

Specifications for Cast Stone (ACI 704-44)
4 pages: 35 cents per copy

Minimum Standard Requirements for Precast Concrete Floor Units (ACI 711-53)
16 pages in covers: 50 cents per copy (40 cents to ACI Members)

Recommended Practice for the Construction of Concrete Farm Silos (ACI 714-46)
16 pages in covers: 50 cents per copy (40 cents to ACI Members)

Recommended Practice for the Application of Mortar by Pneumatic Pressure (ACI 805-51)
12 pages in covers: 50 cents per copy (40 cents to ACI Members)

Lightweight construction handbook

Zonolite Co. has published booklet G-66, "Systems of Lightweight Construction," which outlines uses, installation procedures, and specifications of vermiculite products in lightweight construction. A 2-page section reviews basic aggregate requirements for lightweight construction and compares them with vermiculite properties. A summary of fire test ratings for structures involving vermiculite, and an outline of plaster fireproofing advantages are given.—Zonolite Co., 135 South LaSalle St., Chicago 3, Ill.

Block unloader

The "Kid Glove" block unloader, developed by Imperial Construction Equipment Co., requires no pallets or rods. The gripping device consists of a frame with rubber gripping pads which are pressed into contact with the bottom tier of block by hydraulic pressure. The aluminum outriggers can be set up on either side of the truck. Four miniature turntables change the direction of the carrier wheels from the track on the truck to the track on the outrigger. Block may be stacked up to 8 ft high.—Imperial Construction Equipment Co., 230 West North Ave., Northlake, Ill.

Water soluble paint

Glazroc, a paint for line marking, and building interiors and exteriors has been developed by Rock Paint and Chemical Co. The paint is said to be fast drying, odorless, fire resistant, suitable for covering most building materials, and can be thinned with water.—Rock Paint and Chemical Co., Fort Atkinson, Wis.

Brick machine

Model R-100 Rainbow Rock machine has been announced by General Engines Co. Rainbow Rock is a high compression adobe concrete slump brick. Some of the features of the new machine are: sealed compressed air system; vibrator assembly mounted in sealed, self-aligning ball bearings; powered by 1-hp electric motor; intense vibration in mold box; and all-steel, heavy-duty construction, electrically welded throughout.—General Engines Co., 307 Hunter St., Gloucester, N. J.

Equipment catalog

A 16-page illustrated catalog, No. 552, has been published by Stow Manufacturing Co. showing its complete line of concrete equipment.—Stow Manufacturing Co., 275 Shear St., Binghamton, N. Y.

Masonry saw blade

A new masonry saw blade has been developed by Clipper Manufacturing Co. The "Polk-A-Dot" blade features abrasive protrusions symmetrically distributed on both sides. These protrusions are said to act like an extra cutting edge. Reduced friction is said to result in more power being delivered to the cutting edge of the blade. The blade is said to run cooler and smoother, and cut faster with less wear.—Clipper Manufacturing Co., 2800 Warwick, Kansas City 8, Mo.

Plastic tape

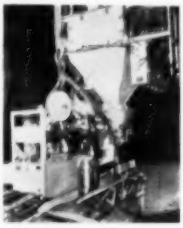
Pressure-sensitive plastic tape has been used by Robert E. McKee General Contractor, Inc., Dallas, for sealing form joints on the new Statler Hilton Hotel. The "Scotch" brand plastic tape No. 471 prevented possible fins or beads from forming at the joints of 4 x 8 ft plywood sheets. The tape is also said to have prevented moisture from deteriorating the edges of the plywood.—Minnesota Mining and Manufacturing Co., St. Paul 6, Minn.

"Bubble" forms

Giant pneumatic "bubbles" for forming concrete shells are being produced by The Garret Corp. The technique, which is being used for low-cost houses, storage plants, gas stations, and similar structures, consists of shotcreting over the inflated neoprene-nylon forms. Two or three layers are sprayed on to form a 3- or 4-in. shell. The form is deflated when the concrete hardens and can be reused.—The Garret Corp., 9851 Sepulveda Blvd., Los Angeles 45, Calif.

Packaging machine

Bemis Bro. Bag Co. has produced a gravity-feed packaging machine which weighs ingredients, fills, and closes bags in a single operation. The machine contains a three-bucket scale which weighs and dumps three separate elements of a mix. A volumetric auger device also adds small quantities of a fourth ingredient when needed. The filled bag moves down a conveyor through a sewing head where the bag is closed.—Bemis Bro. Bag Co., 408 Pine St., St. Louis, Mo.



Prestressing bars

Rods, Inc., has offered a brochure, "High Tensile Alloy Steel Bars for Prestressed Concrete," which gives basic information about Stressrods, prestressing bars distributed on the West Coast.—Rods, Inc., 706 Folger Ave., Berkeley 10, Calif.

Calcium chloride for concrete and cinder block

Calcium Chloride Institute has issued a bulletin, Brief CB-1, "Calcium Chloride for Concrete and Cinder Block." It presents information on the uses and advantages of calcium chloride in block manufacture.—Calcium Chloride Institute, 909 Ring Bldg., Washington 6, D. C.

ACI publications in large current demand

Manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315-51)

This standard is of large format, bound to lie flat and presents typical engineering and placing drawings with discussion calling attention to important considerations in designing practice. It was prepared to simplify, speed, and effect standardization in detailing. It was revised in 1951 to bring it into accord with design changes made possible by the use of the new A505 bars. The only publication of its kind in English, it is meeting wide acclaim among designers, draftsmen and in engineering schools. Price—$3.00, to ACI Members—$1.75.

Manual of Standard Practice for Detailing Reinforced Concrete Highway Structures (ACI 315A-53)

This standard is of large format, bound to lie flat, and presents typical engineering and placing drawings for highway structures. It was prepared to simplify, speed, and effect standardization in detailing. Sections on drawings and details and fabricating shop practice are translated into practical examples in typical drawings of piers, various type bridges, retaining walls, and various type culverts. Prepared in collaboration with American Assn. of State Highway Officials with cooperation of Concrete Reinforcing Steel Institute. Price—$2.75, to ACI Members—$1.50.

ACI Standards—1954

270 pages, 6 x 9 reprinting current ACI Standards: Building Code Requirements for Reinforced Concrete (ACI 318-51); Minimum Standard Requirements for Precast Concrete Floor Units (ACI 711-53); seven recommended practices: Use of Metal Supports for Reinforcement (ACI 319-42); Winter Concreting Methods (ACI 604-48); Selecting Proportions for Concrete (ACI 613-54); Measuring, Mixing and Placing Concrete (ACI 614-42); Application of Portland Cement Paint (ACI 616-49); Construction of Concrete Farm Silos (ACI 714-46); Application of Mortar by Pneumatic Pressure (ACI 805-51) and three specifications: Design and Construction of Reinforced Concrete Chimneys (ACI 505-54); Concrete Pavements and Bases (ACI 617-51) and Cast Stone (ACI 704-44)—twelve ACI Standards in one book, $3.50 per copy—to ACI Members, $1.75.

Bibliography on Prestressed Concrete (1954)

ACI-ASCE Joint Committee 323, Prestressed Reinforced Concrete. This 86-page book lists 2000 American and foreign literature references on the subject of prestressed concrete, published 1896 through 1953. A separate section lists some 60 United States, British, German and French patents. The 8½ x 11-in. format is also punched for easy filing in three-ring binders. Price $2.00.

Cellular Concretes (1954)

Prepared for ACI by Rudolph C. Valore, Jr. A review is given of methods of preparation and physical properties of moist and high-pressure steam-cured cellular concretes, ranging in density from 10 to 100 lb per cu ft, as they have evolved in Europe in the past 30 years. Data are given for Swedish, Danish, Russian, German, British, and Belgian materials, and for experimental mixtures prepared at the National Bureau of Standards. 44 pages, price $1.00.

ACI Manual of Concrete Inspection (1955)

This 232-page pocket size book, bound in durable cover, sets up what good practice requires of concrete inspectors and background information on the "why" of such good practice. This third edition was revised and extended by Committee 611 to include new practices evolved since the second edition of 1941. Price $2.50—to ACI Members, $1.50.

Reinforced Concrete Design Handbook (1955) (Available about September 1955)

An extensive revision by a reconstituted Committee 317 of the original well-known edition of 1939. Tables are revised to reflect changes in range of working stresses encountered in general practice. The original objective to reduce the design of members under combined bending and axial load to the same simple form as is used in the solution of common flexural problems is retained. Price $3.50—to ACI Members, $2.00.

For further information about ACI Membership and Publications (including pamphlets presenting synopses of recent ACI papers and reports) address:

AMERICAN CONCRETE INSTITUTE 18263 W. McNichols Rd. Detroit 19, Michigan

To simplify, speed, and effect standardization in detailing

Manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315-51)

Price — $3.00 (to ACI Members — $1.75)

The manual illustrates typical engineering and placing drawings prepared according to the standards. The designs are not intended as standard designs, although in general they meet the requirements of the American Concrete Institute's "Building Code Requirements for Reinforced Concrete." They are intended to show **standard detailing methods.**

Typical drawings

Concrete joist floor
Flat slab floor
Beam and girder floor
Two-way slab and beam floor
Foundations
Columns
Architectural concrete building
Wall details
Stair details
Circular tank

and the companion volume

Manual of Standard Practice for Detailing Reinforced Concrete Highway Structures (ACI 315A-53)

Price — $2.75 (to ACI Members — $1.50)

The "Highway Manual" covers the detailing of highway structures in much the same manner that the "Structures Manual" covered the detailing of building construction, the only difference in material being that while the latter conforms completely to the ACI Building Code, the former follows also the specifications of the American Assn. of State Highway Officials.

Typical drawings

Deck girder bridges
Bridge piers
Steel beam spans with concrete slabs
Pile trestles
Slab bridges
Concrete arch bridges
Retaining walls
Double box culverts
Arch culverts
Headwalls

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DISCUSSION

Discussion closed January 1, 1955

Sept. Jl. '54

Specification for the Design and Construction of Reinforced Concrete Chimneys (ACI 505-54)—ACI Committee 505

Recommended Practice for Selecting Proportions for Concrete (ACI 613-54)—ACI Committee 613

Properties of Heavy Concrete Made with Barite Aggregates—L. P. Witte and J. E. Backstrom

One-Piece Reinforced Plastic Forms for Assembly Line Production of Thin-Shell Concrete Roof Sections—George P. Duecy and John L. Hutsell

Discussion closed February 1, 1955

Oct. Jl. '54

Admixtures for Concrete—ACI Committee 212

Precast Concrete Sandwich Panels for Tilt-Up Construction—F. Thomas Collins

Production of Sand and Gravel—Stanton Walker

Ultimate Strength in Shear of Simply-Supported Prestressed Concrete Beams Without Web Reinforcement—E. M. Zwoyer and C. P. Siess

Discussion closed March 1, 1955

Nov. Jl. '54

Model Analysis of a Skewed Rigid Frame Bridge and Slab—D. H. Pletta and D. Frederick

Fundamental Factors in the Drying Shrinkage of Concrete Block—George L. Kalousek

Test Hammer Provides New Method of Evaluating Hardened Concrete—Gordon W. Greene

Ultimate Load Theory and Tests of Cylindrical Long Shell Roofs—G. C. Ernst, R. R. Marlette, and G. V. Berg

"Accidental" Air in Concrete—M. F. Macnaughton and John B. Herbich

Permeability of Portland Cement Paste—T. C. Powers, L. E. Copeland, J. C. Hayes, and H. M. Mann

Discussion closed April 1, 1955

Dec. Jl. '54

Shear Strength of Reinforced Concrete Beams. Part 1—Tests of Simple Beams*—K. G. Moody, I. M. Viest, R. C. Elstner, and E. Hognestad

Effect of Algae Infested Water on the Strength of Concrete—Benjamin C. Doell

Observations on the Resistance of Concrete to Freezing and Thawing—Hubert Woods

Some Failures of Reinforced Concrete Storage Bins—Louis E. Vandegrift

Static and Fatigue Tests on Partially Prestressed Concrete Constructions—Paul William Abeles

Discussion closes May 1, 1955

Jan. Jl. '55

Structural Applications of Hyperbolic Paraboloidical Shells—Felix Candela

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Design and Construction of a Folded Plate Roof Structure—Milo S. Ketchum

Ribless Cylindrical Shells—Mario G. Salvadori and A. D. Ateshoglou

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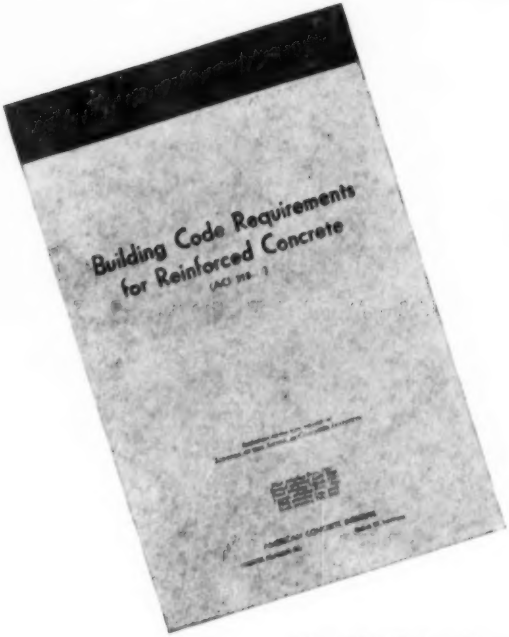
*Discussion considered on the basis of the entire series (four parts) closes July 1, 1955.

ACI Building Code

ASA A89.1—1951



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